The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXII. No. 560 MARCH 22, 1930 Prepaid Annual Subscription: United Kingdom, £1.1.0; Abroad, £1.4.0

Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE *is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders, and Postal Orders should be made payable to Benn Brothers, Ltd.*

Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, *have for some years past adopted the five-day week, and the editorial and general offices (Bouverie House, 154, Fleet Street, London, E.C.4), are closed on Saturdays.*

Telegrams: "Allangas, Fleet, London." Telephone: City 0244

Improving Overseas Trade

THE returns of chemical overseas trade for February, published in THE CHEMICAL AGE of last week, promise well for the current year. A combined decrease of £80,129 in imports and increase of £78,930 in exports is a very satisfactory position. If the first two months of this year are taken, the results are even better. The January and February figures together disclose a decrease of £354,256 in imports and an increase in exports of £21,499 over 1929 and of £119,828 over 1928. It is clear that the policy of making British chemical products better known in overseas markets is producing its effects; that this fact is increasingly appreciated by British firms is shown by the large amount of advertising space already booked for our Annual Spring Issue, to be published next week. A great deal of effort and money has been expended in recent years on this policy of expansion overseas. It is gratifying to know that this is bearing fruit and that British chemical manufacturers will be encouraged to continue the campaign.

Turning to the details we find reduced imports in the cases of anhydride, acetic, and tartaric acid, bleaching materials, potassium compounds, sodium compounds, cream of tartar, drugs, medicines, etc. There are increases, however, in painters' colours and materials, dyes and dyestuffs, crude and distilled glycerine, and borax. The exports show another substantial increase in sulphate of ammonia (from £379,763 to £450,450), mainly to Spain and the Canaries. Coal tar products have advanced appreciably (tar and creosote oils from £4,030 to £90,566) as well as sodium compounds. Dyestuffs, painters' colours and materials—the latter a strong feature as a rule—and drugs, etc., are slightly down, and the decline in glycerine exports corresponds roughly with the increase in imports.

Wrong Views on Unemployment

UNEMPLOYMENT continues to be the principal topic in industrial and political discussion, and no one can deny the extreme gravity of the problem. At the same time, the facts of employment are apt to be obscured by the stress laid on unemployment, and there is in consequence a widespread lack of information on the brighter side of the picture. The importance of remembering this aspect of industry was emphasised by Sir Josiah Stamp in a discussion with Mr. Maynard Keynes broadcast from London some days ago. In the first place, the official figures do not give a true idea of the situation. It is a mistake to suppose that there is a solid mass of unemployment, in which over a million men find themselves continuously without work. In Sir Josiah's opinion, probably 50 per cent. of those out of work at any particular moment will be in work again in a month's time. In the second place, it is estimated that the normal figures of unemployment due to seasonal fluctuation and other natural causes, would, under the best of conditions, almost certainly be between 300,000 and 400,000. Out of an insured population of over 11,000,000, two-thirds have been hardly touched by the problem since the war. Recent tests over a period of two and a half years showed that 8,000,000 drew no unemployment pay at all.

British industry has shown a remarkable power of actual absorption since the war—there are over a million persons more in employment. When we consider the broken and unstable conditions of industry, it is very much to the credit of this country that we have been able to achieve the task of employing 150,000 more annually. The decrease that is gradually taking place in population figures should ease matters, and in future there will not be so many people entering into industry in excess of those going out. The basic problem is mainly one of balance between specialised skill and specialised capital, and there is no doubt that the dole has affected the old methods of economic adjustment, retarding the necessity for moving about or taking another kind of job that acted automatically before the war. In the distribution of unemployment there are thus geographical as well as industrial factors, the tendency being for expansion of business in the south and contraction in the north.

Comparisons with conditions abroad are often made to our detriment, but figures published in the *International Labour Review* show that the average wage in this country is 27 per cent. higher than in Germany, 43 per cent. higher than in France, and 53 per cent. above the figure for Italy. Since wages enter into production costs, our higher level adds to the difficulty of quoting a competitive price in neutral markets. The cost of the social services must also be taken into account. Sir Josiah Stamp gave the comparative figures of 1911—a representative year before the war—and of 1928, as 14s. 6d. and 91s. 6d. per head respectively. At first sight it would appear that wages are too high, but the view of the economists is rather that the rates in various trades are out of relation. There is also a suggestion of the vicious circle about the problem. The important conclusion, however, is that British industry bears highly favourable comparison with conditions in other countries, and that for ten years past we have steadily added to our employment roll at the rate of 3,000 a week.

The "Compleat" Chemist

We have always suspected the Institute of Chemistry of a truly paternal interest in its members, extending far beyond grounding them in chemical knowledge and arming them with widely recognised diplomas. But the address which Mr. R. L. Collett, the assistant secretary, delivered at Leicester the other day shows that the oversight of the young chemist goes deeper than most people had imagined. The young chemist, he assured his hearers, must be, in addition, of course, to being properly qualified, "a man among men," with a personality of his own, if he wishes to be successful. For example, he must be able, when the occasion arises, to accept a glass of port and a cigar without allowing the unaccustomed treat to cloud his vision. We have actually known some who successfully passed the test. Also, Mr. Collett might have added, he should know how to return these courtesies, taking care that neither the smoke nor the vintage betrays his want of knowledge in these social depths. Further, Mr. Collett warns the young chemist, he must be able to wear morning dress and a tall hat when required, without looking as if they were borrowed for the occasion. Not, of course, when he is strolling around the works or performing his appointed laboratory functions, but merely when he is meeting the managing director or interviewing a financier interested in an invention. The correct sartorial equipment, indeed, has been known to affect people far more than high academical attainments, and the Institute is doing well by its young people in conveying an occasional delicate hint that sound knowledge may be helped by a slight infusion of worldly wisdom. The art of producing a good impression has a distinct market value.

Imported Fertilisers for India

It is well known, our Indian correspondent states, that the imports of fertilisers in India have been increasing rapidly in recent years. A warning in this connection has been given by Mr. Clarke, the Director of Agriculture, U.P. In a recent paper, read before the Indian Science Congress, Mr. Clarke pointed out that if India depended upon imported fertilisers she would be at a great disadvantage in case of international disturbances. It was, therefore, his opinion that manufacture should be established in India itself. Before this was, however, undertaken it was necessary to work out the correct way of using them and to create the demand. He advocated the preparation of quick-acting manures from waste organic material.

Books Received

Handbuch der Kautschukwissenschaft. Edited by Professor Dipl.-Ing. K. Memmler. Leipzig: S. Hirgel. Pp. 766 60M.

Solvents. By Thos. H. Durrans. London: Chapman and Hall. Pp. 144. 10s. 6d.

Colloid Symposium Annual. Edited by Harry Boyer Weiser. London: Chapman and Hall, Ltd. Pp. 300. 22s. 6d.

Organic Syntheses. Edited by Hans T. Clarke. London: Chapman and Hall, Ltd. Pp. 120. 8s. 6d.

The Chemistry of the Colloidal State. By John C. Ware. London: Chapman and Hall, Ltd. Pp. 314. 18s. 6d.

Handbook of Chemical Microscopy. By Emile Monnin Chamot and Clyde Walter Mason. London: Chapman and Hall, Ltd. Pp. 474. 22s. 6d.

Taschenbuch fur die anorganisch-chemische Grossindustrie. By E. Berl. Berlin: Julius Springer. Pp. 402.

Bearing Metals and Bearings. By W. M. Corse. New York: Chemical Catalog Co., Inc. Pp. 382. $7.00.

The Calendar

Mar. 22	Royal Institution: "Atomic Nuclei and their Structure." Sir Ernest Rutherford. 3 p.m.	21, Albemarle Street, London.
24	Society of Chemical Industry (Yorkshire Section): Annual General Meeting. 7 p.m. "The Fundamentals of Lubrication." Dr. N. K. Adam. 7.15 p.m.	Great Northern Station Hotel, Leeds.
25	Institute of Chemistry (Belfast Section): "Helping Nature." Dr. H. Graham. 7.30 p.m.	Royal Belfast Academical Institution.
27	Chemical Society Annual Dinner. 7.30 p.m.	Hotel Victoria, London.
28	Society of Dyers and Colourists. Annual Dinner. 7 p.m.	Hotel Metropole, London.
29	Finsbury Technical College Old Students' Association. Dinner.	Trocadero Restaurant, London.
Apl. 4	Society of Chemical Industry (Newcastle Section): Annual dinner.	Newcastle-on-Tyne.
4	Society of Chemical Industry (Liverpool Section): Annual meeting.	Liverpool.
3	Institution of Chemical Engineers: "Pulverised Fuel." J. T. Dunn and Burrows Moore.	St. Ermins, Caxton Street, London.
4	Institution of Chemical Engineers. Eighth Annual Corporate Meeting. 11.30 a.m. "The Röle of Science in Industry." J. Arthur Reavell. 12.15 p.m. "The High Pressure Equipment of the Chemical Research Laboratory, Teddington." H. Tongue. 2.15 p.m. Annual Dinner. 7 p.m.	Hotel Victoria, Northumberland Avenue, London.
4	Society of Chemical Industry (Birmingham and Midland Section): Annual Meeting. 6.30 p.m. "Some Little Known Causes of Stone Decay." A. R. Warnes. 7 p.m.	Chamber of Commerce, New Street, Birmingham.
9	Institute of Chemistry (London Section): "The Medical Witness." Dr. R. M. Brontë. 7 p.m.	30, Russell Square, London.
10	Optical Society: Annual General Meeting.	London.
11	Chemical Engineering Group: General Discussion on "Asphalt as a Chemical Engineering Material." 8 p.m.	Burlington House, Piccadilly, London.
16	Society of Glass Technology: Annual general meeting.	Sheffield.
28	Oil and Colour Chemists' Association. Annual Dinner. 7 p.m.	Connaught Rooms, London.

I.C.I. v. I.G. Patent Action

Higher Scale Costs Allowed; Appeal Time Extended

In the Chancery Division, on Thursday, Mr. Justice Maugham had before him again the case of I.C.I. against the I.G. Farbenindustrie, in which he gave judgment last week, and which had reference to three selection patents of the I.G. with regard to mono-azo dyes.

The case has been fully reported in The Chemical Age, and a summary of the judgment appeared in our last issue.

The Hon. Stafford Cripps, K.C., for I.C.I., who were the petitioners, asked that the Order of the Court should now be that the motion to amend the patents be dismissed with costs, and that the objections be allowed with costs, and an order addressed to the Comptroller to revoke the three patents in question.

His Lordship: Yes.

Mr. Cripps asked that costs should be allowed on the higher scale. Having regard to the nature of the case, he submitted that this was a proper case in which such costs should be allowed.

Mr. Whitehead, K.C., for the I.G., contended that this was a case in which no such order should be made as to costs.

His Lordship: Was not this case one of the very greatest importance, and the judgment of a far-reaching nature?

Mr. Whitehead admitted this.

His Lordship observed that the I.G. was a large and wealthy company with extensive ramifications, and they were fighting not merely for the three patents in question, but in order to try and elucidate the great question of selection, and the importance of the case was a thing they ought to bear in mind.

Mr. Whitehead admitted the importance of the case, but submitted that, under the circumstances, costs on the higher scale should not be allowed.

His Lordship held that, having regard to the nature and importance of such cases, special grounds must be held to exist, and he gave costs on the higher scale in the same form as in the Commercial Solvents case.

His Lordship also directed that I.C.I. should have the costs of certain experiments they had carried out, and the costs involved in preparing the history of the chemistry of the case. The order would date from to-day, in case there was any appeal.

Mr. Whitehead asked that the time for appeal should be extended for a month. He was going to Germany in a fortnight's time, and the question of appeal would then be discussed.

Mr. Cripps hoped that his learned friend would not take too long over the matter, as I.C.I. were anxious to get the patents revoked. He suggested that the Order revoking the patents should be drawn up and should lie in the Patent Office for a month, pending the decision to appeal.

His Lordship directed that the time for appeal should be extended for a month, and ordered that the Comptroller's costs must be paid by the I.G.

Mr. Justice Maugham on Chemical Selection Patents

Essential Conditions of Validity

In delivering judgment in the Chancery Court last week in the patents action between Imperial Chemical Industries and the I.G. Farbenindustrie relating to three selection dyestuffs patents held by the respondents, which the petitioners asked the Court to revoke, Mr. Justice Maugham carefully laid down the conditions that a selection patent should comply with. We give below the text of his judgment on these points.

This case seems to be the first which has arisen in these Courts in which the question of the validity of a chemical selection patent has been directly considered. It may be observed that chemical patents in recent years have consisted of two sharply divided classes.

The first class is that of patents based on what may be described as an originating invention, that is, the discovery of a new reaction or a new compound. Such patents may be called for brevity "originating patents."

The second class comprises patents (the so-called selection patents) based on a selection of related compounds such as the homologues and substitution derivatives of the original compounds which presumably have been described in general terms and claimed in the originating patent. The number of combinations possible is really surprising. The mono-azo dyes with which the patents in suit are concerned are, as we have seen, the result of combining with a diazo component a coupling component of a certain kind. Any arylamine containing the amine (NH_2) group can be diazotised and can be coupled with any phenol (the compound produced by the introduction of a hydroxyl, OH, group into the benzene ring of an aromatic compound).

In 1897 it was estimated by Bulow in his "Azofarbstoffe" that from the amines and phenols then known some 23,000 simple azo dyes of this type were possible, and if dyes containing two azo groups were included the number rose to over three million. It is said that over ten million are now known to be capable of manufacture. It is evident that the inventive step involved in the originating patent, for example, such a step as the Griess reaction to which I have above referred, differs in kind from the systematic investigation or research required to ascertain that some of the combinations possible under the originating patent, for example, selected arylides and diazo compounds made according to the prior specifications, possess distinctive and, it may be, unexpected properties.

Subject-Matter of Selection Patents

The question has been raised in the present case whether it is possible to show subject-matter in respect of a selection patent in the sense in which I use the word. I have come to the conclusion that such a patent may well be valid and that properly considered there is no more difficulty in such a case in establishing subject-matter than there is, say, in a mechanical or a combination patent. It must be remembered, of course, that the selected compounds have not been made before, or the patent would fail for want of novelty. If the selected compounds, being novel, possess a special property of an unexpected character, for example, if a mono azo dye were to be made by selecting components not hitherto employed which resulted for the first time in a green dye, I cannot see that the inventive step essentially differs from the step involved in producing a new result by a new combination of well-known parts or, indeed, from using the common and well-known factors (cranks, rods, toothed wheels and so forth) employed in mechanics in the consruction of a new machine.

No Prevision in Chemistry

In a sense it is still true to say that there is no prevision in chemistry. Any one of the millions of dyestuffs in question might be found to possess some unexpected and distinctive properties, either of colour or fastness, or to have some other incidental advantage. There is no short cut to knowledge of this kind. A laborious and systematic investigation of a long series of combinations becomes necessary; and it is the fact that of recent years certain industrial organisations with enormous financial resources have established laboratories where numbers of chemists of high scientific attainments devote their lives to a systematic examination on scientific principles of a vast number of chemical substances.

Inventor's State of Mind

In considering the question of subject-matter in relation to selection patents, it is important to bear in mind that the Courts are not in any way concerned with the state of mind of the inventor. Patents may be granted for inventions which have been the result of profound research or of some sudden and lucky thought or of mere accident, and also for inventions imported from abroad without the knowledge of the inventor. (Chief Justice Tindal in the case of *Crane* v. *Price* (1842), 1 Webster's Patent Cases, 377, at p. 411). In the case of *Sharpe and Dohme Inc.* v. *Boots Pure Drug Co.* (45 Reports of

Patent Cases, p. 153), Mr. Cripps propounded a question which was adopted as correct by all the Lords Justices in the Court of Appeal (pp. 173, 176).

It involves, I think, a corollary, that if for practical purposes it is not obvious to skilled chemists in the state of chemical knowledge existing at the date of a selection patent that the selected components possess a special property, there is then, or at least there may be, a sufficient "inventive step" to support the patent. As a consequence of the view that what has occurred in the mind of the inventor is immaterial, it is quite the exception for the "true and first inventor" to be called to give evidence in the modern patent action.

The Court is concerned, so far as subject-matter is concerned, only with the results. The invention must, of course, add something of a substantial character to existing knowledge; but the Courts do not inquire into the way in which the conquest was achieved. If the language of metaphor may be used, the citadel may be captured either by a brilliant *coup-de-main* or by a slow and laborious approach by sap and mine according to the rules of the art; the reward is the same. The language used by eminent judges in analogous cases supports the same view (*Taylor and Scott* v. *Annand*, 18 Reports of Patent Cases, p. 53, at pp. 62–3; *Lancashire Explosives Co.*, v. *The Roburite Explosives Co.*, 12 Reports of Patent Cases, p. 470, at p. 475).

On the other hand, as I have indicated, it must be remembered that the result achieved must not be obvious even to persons skilled in the art and well acquainted with the published information in regard to the problem with which the invention is concerned. It is clear, for example, that mere verification is not invention (*Sharpe and Dohme Inc.* v. *Boots Pure Drug Co.*, 45 Reports of Patent Cases, p. 153). Where the method of manufacture is laid down in the originating patent, the selection patent must not be an exact repetition of the same process coupled with a statement of the properties possessed by the selected bodies. No man can have a patent merely for ascertaining the properties of a known substance.

Conditions of Selection Patents

Counsel on both sides have endeavoured in their able arguments to assist me by defining the conditions on which selection patents (if valid at all) can be supported. On consideration I think it would be unwise to endeavour to state in definite language all the conditions on which a selection patent must depend; for after all a selection patent does not in its nature differ from any other patent and is open to attack on the usual grounds of want of subject-matter, want of utility, want of novelty, and so forth.

Three general propositions may, however, I think, be asserted as true.

First a selection patent to be valid must be based on some substantial advantage to be secured by the use of the selected members. (The phrase will be understood to include the case of a substantial disadvantage to be thereby avoided.)

Secondly, the whole of the selected members must possess the advantage in question.

Thirdly, the selection must be in respect of a quality of a special character which can fairly be said to be peculiar to the selected group.

The first proposition is plain (see the statement of Mr. Justice Parker in *Clyde Nail Co.* v. *Russell*, 33 Reports of Patent Cases, p. 291, at p. 306). I will add that this condition must not be assimilated with the doctrine of utility as applied to an originating patent. In such a patent there may well be invention without utility. In a selection patent the condition that there must be a substantial advantage attributable to the use of the selected members is inherent in the so-called invention.

The second proposition is derived from the circumstance that if the selection embraces selected members which do not possess the alleged advantages, the selection is defective and the patent would be misleading and would also fail for insufficiency and non-utility. It is not, however, intended to suggest that a few exceptions here and there would be regarded as invalidating the patent.

The third proposition requires a little explanation. If there are five thousand possible members of the group, and a hundred have been selected as possessing some new and definite advantage, it is not intended to assert that such a selection patent would be bad if it were shown as the result of further research that there existed another hundred members possessing the same advantage. If, on the other hand, it were to be established that there were a thousand unselected members which possess the same advantage, I doubt very much whether the patent could be sustained. The quality must be of a special character. It must not be one which those skilled in the art will expect to find in a large number of the members. It would be rash to attempt a closer definition; for the question is ultimately one of appreciation. Returning to the same old-fashioned metaphor I would say that the citadel must be defended, and that there is no reward if the gates have been opened at the first blast of the trumpet.

Selection Patent Specifications

I must add a word on the subject of the drafting of the specification of such a patent. It should be obvious after what I have said as to the essence of the inventive step that it is necessary for the patentee to define in clear terms the nature of the characteristic which he alleges to be possessed by the selection for which he claims a monopoly. He has in truth disclosed no invention whatever if he merely says that the selected group possesses advantages. Apart altogether from the question of what is called sufficiency, he must disclose an invention; he fails to do this in the case of a selection for special characteristics, if he does not adequately define them. The cautions repeatedly expressed in the House of Lords as regards ambiguity have, I think, special weight in relation to selection patents (*Natural Colour, etc., Ltd.* v. *Bioschemes, Ltd.*, 32 Reports of Patent Cases, p. 256, at p. 266; and *British Ore, etc., Ltd.* v. *Minerals Separation, Ltd.*, 27 Reports of Patent Cases, p. 33, at p. 47).

I will summarise the conclusion at which I have arrived by saying that in a selection patent the inventive step lies in the selection for a useful and special property or characteristic adequately defined; and this is the proposition which has to be kept in mind in considering the application to amend and the petition for revocation.

Sale of Synthetic Shellac

Action Against Manufacturer Dismissed

In the Chancery Division on Thursday, March 13, Mr. Justice Clauson had before him an action by Mr. Douglas U. Nicol, of Marine Square, Brighton, against Mr. Robert Brownlow, of Willing House, Gray's Inn Road, London, to recover commission alleged to be due for the introduction to the defendant of a purchaser of a secret process for manufacturing synthetic shellac.

Plaintiff stated that the defendant gave him a commission note promising to pay him 10 per cent. on whatever sum he might get in introducing a purchaser. Plaintiff's case was that he introduced a Mr. H. M. Rushton, who agreed to pay the defendant £5 per ton for every ton of shellac manufactured, with a minimum royalty of £2,000 a year, Mr. Brownlow to be employed at a remuneration of £1,000 a year.

Defendant denied that it was the plaintiff who introduced Mr. Rushton.

His lordship came to the conclusion that the plaintiff was not the effective introducer of Mr. Rushton and dismissed the action with costs.

Northern Ontario Fire Clays

The Ontario Department of Mines has just issued Part IV of its annual report for 1929, which contains particulars of tests by W. S. Dyer and R. J. Montgomery on samples of fireclay quarried in the neighbourhood of the recently discovered lignite deposits of the James Bay region. The same report contains a survey of the ceramic industry in Ontario (interim report by R. J. Montgomery) bringing up to date one prepared by M. B. Baker as far back as 1906. The investigations cover the operations in 1928 of about 100 plants mainly in Toronto, or in eastern Ontario, some of which had been abandoned owing to the prevailing practice of producing all the year round in larger plants in preference to small-scale operations covering four to six months of the year. The report can be consulted by persons interested at the Canadian Building, Trafalgar Square, London.

Monel Metal: Production, Properties and Applications

By Norman C. Marples, M.Sc.

A paper on Monel Metal, presented on Tuesday evening before the Hull Chemical and Engineering Society, by Mr. Norman C. Marples, M.Sc. (of Monel-Weir, Ltd., Cathcart), contained some interesting notes on its production, qualities, and industrial applications. The paper was illustrated by numerous slides. In addition to the chemical applications mentioned, the author demonstrated the suitability of the alloy for many other uses.

THIS alloy takes its name from that of Mr. Ambrose Monell, who was President of the International Nickel Co. when the alloy was first produced in 1905. This company had for many years been engaged in mining and smelting the nickel ores from the Sudbury District of Ontario, Canada. One very large belt of ore was found to contain, in addition to the nickel, a relatively high percentage of copper. As the separation of the two metals under these conditions was both difficult and expensive, it was decided to smelt out the two metals simultaneously and to examine the commercial merits of the resulting alloy.

The alloy, proportioned by nature, was found to contain approximately two-thirds nickel, with the balance copper, except for about 3 per cent. of impurities—mainly iron—and 2 per cent. manganese added to facilitate working. Improved technique has enabled the other metals present to be reduced to 3 per cent., which brings the total nickel/copper content up to 97 per cent. On investigation it showed itself to be superior to pure nickel, not only in its resistance to the corrosive action of many mediums, but also in its mechanical properties. A recent study of the mechanical properties and corrosion resistance of the whole nickel/copper series has shown that these are highest in the range 60/80 per cent. nickel, with an optimum of around 65 per cent. nickel. The extent of the commercial development of Monel metal may be judged from the fact that the present world consumption exceeds 1,400 tons per month (equivalent to 16,800 tons per annum).

Physical and Mechanical Properties

The physical properties of Monel metal are pretty much what one would expect, since copper and nickel are mutually soluble in all proportions, and the alloy, Monel Metal, is therefore a typical solid solution. This implies that once the cored condition of the cast ingots has been broken up by forging or rolling, the structure will be uniform. On this account the microstructure of Monel Metal resembles that of a pure metal, and it differs therefore from that of most of the steels, and certain of the brasses, in that the latter contain two or more constituents even in the forged condition. This is important from the corrosion standpoint, since there can therefore be no selective attack.

From the point of view of mechanical properties Monel Metal stands high, and even in the annealed condition it is considerably stronger than mild steel. In the normal hot rolled condition it has an ultimate tensile strength in excess of 34 tons per square inch, though some bars range higher than this if they are finished rather cold in the hot mill. Monel Metal is characteristically tough, and retains this toughness even after severe cold working.

The mechanical properties of Monel Metal are capable of being very greatly enhanced by cold work, and this cold working can be done without any danger of rendering the metal brittle. Monel Metal is, for example, widely employed for propeller shafts of speed boats. These are supplied in the form of cold drawn rod to the following specification :

Ultimate Tensile Strength	40/45 tons/sq. in.
Yield Point	35/38 ,,
Proportionality Limit	30/32 ,,
Elongation	20% on $4\sqrt{\text{area}}$

With Monel Metal shafts of the characteristics just outlined, all danger of whipping is eliminated, and some engine builders now practically insist that Monel Metal shafts be used with their engines, so as to ensure complete absence of vibration, which might otherwise be attributed to their engines being improperly balanced.

Other applications of this cold worked hard strain annealed material include disc and plate valves for air compressors, as well as springs which have to operate under corrosive conditions or high steam temperatures. For spring wire much heavier cold reductions are possible than in the case of heavy rods, and therefore a tensile strength of over 60 tons per square inch, with corresponding higher yield point and proportionality limit, are aimed at.

Characteristic Qualities

From the industrial standpoint absolute corrosion resistance is seldom the only factor which has to be considered. In his materials the engineer is forced to demand not simply corrosion resistance alone, but in general some other property such as hardness, strength at normal or elevated temperatures, durability under conditions of rough usage, and—possibly more important than all—amenability to working and fabricating operations. Unless this latter property is available the applications of any material are indeed very circumscribed.

Of the various metals available to engineers which offer him also some degree of corrosion resistance, there are, of course, the brasses and bronzes ; these are relatively soft and weak, and are unsuitable for severe corrosion. Lead, although remarkably resistant to H_2SO_4, is useless except as a covering, and even then its softness offers great difficulties. Tin is similar. Copper has a wider usefulness ; its toughness and ductility have made it of enormous value for many hundred years, but for shafts and rods and bolts and such parts, it is softer than is desirable, and its range of chemical usefulness is also relatively circumscribed.

At the other end of the scale are the silicon irons. Chemically they are extraordinarily resistant. They can be exposed to boiling mineral acids, except HCl, indefinitely without detriment. On the other hand, they are available in the cast form only. They cannot be machined or drilled, and are ground only with difficulty, and are too brittle for many tasks. There remain the rust resisting steels. The first series, containing no nickel and about 12 per cent. of Cr, are limited by the fact that their corrosion resistance is dependent on suitable heat treatment and a polished surface. As a result, most fabricating operations diminish their resistance, and they must be adopted with reserve. The second series, containing 8 to 10 per cent. of nickel and 14 to 18 per cent. of Cr, although particularly valuable for strength and resistance to corrosion over an extensive range, work harden very rapidly. In consequence, cold pressing, bending, shearing and even machining is difficult, and, the annealing temperature being around 1100° C., softening is expensive and possible only in special furnaces not generally available to engineers.

As against the very definite limitations of the materials just described, Monel Metal offers excellent amenability to normal working operations. It can be machined, cast or forged, welded by either the oxy-acetylene or electric processes, soft or silver soldered or brazed, and drawn into fine wire or special profiles. Certain of these operations require modifications of the technique as applied to steel or copper, but such changes are in the main well within the capacity of plants handling these latter materials.

Corrosion Resistance

Monel Metal is not sensibly corroded by the elements, even in the rather impure form found in industrial centres. It is unaffected by sea and estuarine waters, even in tropical countries. It is impervious to the action of alkalis, and is in consequence much used for evaporators and other plants in the production and recovery of caustic soda. It is but little affected by ammonia, and, excluding nitric acid and sulphurous acid, it offers a very useful resistance to the acids at the concentrations and strengths usually found in industry.

The industrial user naturally asks for something rather more definite than this, and frequently demands a definite " Yes " or " No " to the question, " Will Monel Metal resist a certain acid or chemical ? " While we should like to be able to give a direct answer, it must be remembered that all corrosion is purely relative, since even platinum and its related

metals are corroded by certain reagents. Consequently, since industrial corrosion problems frequently involve so many variables, it is seldom, if ever, possible to give a definite answer.

In practically every industrial corrosion problem several variables may be acting together in greater or less degree. Consequently the prediction of the suitability or otherwise of a metal for a particular purpose simply on the basis of stagnant tests carried out in the laboratory is a practical impossibility. It is for this reason that we prefer to treat each problem on its merits and to co-operate with the engineers concerned in the study of their particular problem.

Applications in Chemical Industries

Some idea of the very numerous applications of Monel Metal in the process industries will be gleaned from examples. There is, for example, a pump handling acetic acid. This pump, working in the American works of the Monsanto Chemical Co., has given five times the service previously obtained from the so-called acid-resisting bronze pumps.

Monel Metal centrifugal baskets for the drying of sulphate of ammonia are in service in many of the leading gasworks and coke oven plants in this country and in Europe. They have proved to be of particular value where, in addition to its function as a centrifuge, neutralisation of the last traces of acid is effected in the basket by spraying in ammonia liquor during the whizzing operation. These conditions of service are particularly severe, since the metal has to withstand not only the sulphuric acid carried by the crystals from the saturator, but also the action of the added ammonia. Nevertheless, the Monel Metal baskets give a life of six and, in many cases, even ten times that of copper or bronze baskets.

The first cost of the Monel Metal baskets which give this much greater durability should not be more than 40/60 per cent. above that of a copper basket. This relatively small extra first cost is possible, since on account of the higher strength of the Monel Metal, the thickness of the cover, shell, and bottom plates can be considerably reduced without detracting from the strength of the basket. A group of eight baskets are in service in the Central Ammonia Works, Weesp, Holland. This has already handled a throughput of over 5,000 tons in a period of some 2½ years of finished neutral sulphate, and is still in perfect condition and suitable for considerable further service.

Acetic Acid and Dyestuffs

Crystallising pans and transport trucks for acetic acid in service in the plant of the Exchange Lemon Products Co., are used for the final crystallising of pure acetic acid from a vacuum evaporated liquor of 36/40° Be. They have a capacity of 1,150 litres each. Since the crystallising process takes from three to five days, and the finished product is to comply with the rigid purity requirements of the United States Pharmacopeia, this is an excellent example of the use of Monel Metal in the processing of a high purity product.

Monel Metal lined autoclaves for the manufacture of dyestuffs is another important application. The problem was to construct a vessel which would operate at 250 lb. per square inch pressure and 350° F. It was solved by constructing a mild steel boiler with cast steel ends and lining these throughout with ⅛ in. thick Monel Metal sheet. The heating pipes are of solid drawn Monel Metal tubing and the stirring gear consisted of Monel Metal castings mounted on a steel shaft sheathed with Monel Metal. The chemical conditions demand that the contents of the autoclave shall not come into contact with the steel. By means of welded and mechanical joints two such autoclaves were manufactured in our plant at Cathcart, and have been operating with success for over two years. The difficulties to be overcome in withstanding that high pressure, coupled with rapid alternate heating and cooling, will be appreciated by engineers.

Evaporators with Monel Metal tubes and tubeplates are employed both in the manufacture of caustic soda and in the recovery of this from the so-called "black liquor" associated with the sulphate process of paper making. Tests made on caustic soda being evaporated from 32/50 per cent. NaOH at 186° F. under a 27 in. mercury vacuum showed that the corrosion rates for steel, nickel and Monel Metal were respectively as follows :—

Steel	0·64 in. per year
Nickel	0·0013 in. per year
Monel Metal	0·0002 in. per year

From these figures it will be seen that both Monel Metal and pure nickel are very definitely superior to steel for such service, and both these metals are now being extensively adopted for caustic soda evaporation.

In the recently developed Swenson Force Circulation Evaporator the tubes and tubeplates are made of pure nickel, while the control valves and circulating pump are of Monel Metal. Though both these materials are in service under a great many conditions, no cases of caustic embrittlement, which characterises steel when called upon to handle high density caustic, have been reported.

In *Monel Metal conveyor screws and rotary dryers for the finishing of table salt* the use of Monel Metal precludes possibility of the contamination of the salt with rust. After experimenting with various linings for their dryers, Monel Metal was adopted by a leading salt company, and has been in use for over eight years, and is good for at least a further four years. These dryers are 7 ft. in diameter and rotate at 25/30 r.p.m., the capacity of each dryer being 8/10 tons per hour. The salt is dried off from 2½ to 3 per cent. initial moisture, the flame from the coke fire being in direct contact with the salt. The temperature in the dryers is 260° C., and the salt is raised to about 150/180° C. Steel linings were found to be absolutely useless owing to the rapidity with which they corroded at the wet end of the dryer, and copper alloy linings had a life of barely three years—*i.e.*, as against twelve years.

Other Uses

Other uses of Monel Metal in the chemical industry, to mention only a few of them, include :—*Monel Metal percolators* used in the extraction of herbs, roots and barks in the manufacture of pharmaceuticals ; *storage tanks for essential oils ;* and *vacuum stills for the manufacture of Epsom Salts.*

Steam separators and steam filters are further important applications of growing importance. Monel Metal has been made standard by several manufacturers in order to get permanent dependable filtration.

A word may be added on the wide application of Monel Metal to dyeing machinery. Take, for example, a hank-dyeing machine for artificial or natural silk or similar delicate yarns. A feature of the machine is the dye-tanks, made of heavy Monel Metal sheets. The tanks are 30 ft. long, and are divided into a number of sections by an easily removable watertight partition, which enables the machine to operate on a number of different colours simultaneously, or to act as a single large machine giving uniform results from end to end. It has been found that Monel Metal has a less dulling effect on dyes than any other metal, and the ease with which it can be kept clean permits frequent changes of shade without the prolonged boiling-out operations necessary with wooden equipment. The smooth surface does not harm delicate fabrics, and avoids the damage caused by splinters which inevitably develop when wooden vats have been in use for some time.

Death of Professor Orton

Professor of Chemistry at Bangor

THE death occurred, at his Bangor residence, on Friday, after a week's illness, of Professor Kennedy Orton, Professor of Chemistry at the University College of North Wales, Bangor. Professor Orton, who was 58 years of age, had held the Chair of Chemistry at Bangor since 1903. He was educated at St. John's College, Cambridge, where he was Major Scholar in 1895–6, at Heidelberg, and at University College, London. He was Hutchison Research Student at St. John's in 1895–7, and demonstrator and assistant lecturer in chemistry at St. Bartholomew's Hospital from 1897 to 1903, when he went to Bangor. Professor Orton had been examiner in chemistry to several universities, and was a member of the Council of the Chemical Society and of the Institute of Chemistry. He was also a member of the General Committee of the British Association. He was author and part-author of various papers on scientific subjects. His hobby was ornithology, and he was also fond of mountaineering. Mrs. Orton is at present in India on a visit to her son.

Modern Milling and Pulverising Methods

Some Notes on Modern Machines

In the following paper, read by Mr. W. H. D. Sutherland at a meeting in Manchester of the Junior Institution of Engineers, attended by members of the Oil and Colour Chemists Association, a descriptive account is given of the Swing Hammer Pulveriser, the "Kek" Mill, and the "Circulator" Mill, and of the purposes for which they were designed.

THIS paper deals with the method of reducing all kinds of materials to various degrees of fineness to suit individual requirements; also the blending of (1) solids, (2) solids and liquids, (3) liquids, such as colours, dyes, paints, printing inks, dental and face creams, oils, pharmaceutical preparations, etc. The degree of fineness to which these materials are reduced varies considerably, and a standard is set for each particular job by the use of a sieve or screen of a known fineness and may be anything from 1 in. mesh down to 1/200th in. mesh.

There are a large number of machines on the market for this purpose, but it is proposed only to deal with three types, namely:—The Swing Hammer pulveriser for medium fine grinding; the "Kek" Mill for fine dry grinding and the blending of liquids; and the "Circulator" Mill for wet grinding.

The Swing Hammer Pulveriser is a machine used for reducing semi-abrasive materials to a fineness of approximately $\frac{1}{8}$ in. mesh and finer when taking a feed of medium sized material, the size depending upon the hardness of the material and the machine being fed. All crushing and pulverising machines used for reducing semi-abrasive materials require renewable linings wherever exposed to the material being reduced, and these machines must be heavily constructed and well balanced to withstand the severe service and high speed necessary to carry out their work.

The Swing Hammer Pulveriser operates on the principle of reducing material by striking it while in suspension. The material is fed into the machine near the top, and in falling comes in contact with a rapidly revolving cylinder, the outer part being made up of hardened steel or manganese steel hammers, which strike the material and drive it against the breaker plates from which it rebounds into the path of the revolving hammers. The fineness to which the material is reduced is determined by the intensity of the blow, and the various degrees of fineness may be obtained by simply varying the speed of the machine.

For Changing Swing Hammers

Inside the machine, and fastened concentric to the shaft, are a number of steel discs of equal distance apart, and between these discs the hammers are fitted. Passing through the discs near the outer edge and parallel with the shaft are a number of steel rods, known as hammer pins, and it is upon these pins that the hammers swing—hence the name "Swing Hammer." The pins are easily withdrawn, provision being made at the ends of the machine by small hand doors, thus the changing of the hammers is a simple process. The hammers are double-ended, and when one edge has worn away they may turn round or upside down, thereby ensuring long life.

The shaft upon which the hammer discs are fitted is of large dimensions (to withstand the severe strains set up during the working of the machine) and runs in self-oiling white metal bearings. Machines for heavy work are fitted with roller bearings. The inside of the machine is lined with hardened steel liners and breaker plates. The breakers are adjustable, thus any wear on them may be taken up.

The bottom half of the machine is fitted with tropizoidal screen bars, this type allowing the material to pass out of the machine freely, but at the same time preventing oversize material from being discharged. Spacing racks are used in conjunction with the screen bars, thus producing a method whereby the same screen bars may be used for any size opening from 1/16th in. mesh to 1 in. mesh. The racks are divided into convenient lengths, dividing the set of bars into three or four sections and making the sections more easy to handle when putting them in or taking them out.

These machines are capable of a large output, and are used for the reduction of coal, limestone, oyster shell, bones, etc. They are made in various sizes, ranging from 24 in. by 12 in. to 42 in. by 48 in. A machine 24 in. by 12 in. reducing limestone and running at a speed of 1,400 to 1,600 r.p.m. requires approximately 15 h.p. to drive it, and will produce 1 to 2 tons per hour of $\frac{1}{8}$ in. mesh and finer, and 3 to 4 tons per hour when reducing limestone to $\frac{1}{2}$ in. mesh and finer. The same machine reducing oyster shells for chicken grit, running at approximately 800 to 900 r.p.m. and requiring 12 h.p. to drive it, produces 2 to 3 tons per hour, but when reducing them for agricultural lime the horse power is the same, the speed is increased up to approximately 1,500 to 1,600 r.p.m., but owing to the fineness of the mesh only 1 to $1\frac{1}{2}$ tons per hour are produced. Bones are pulverised at approximately 1 ton per hour, the mill requiring 15 h.p. to drive it, and running at 1,400 to 1,600 r.p.m.

The "Kek" Mill

The "Kek" Mill in principle is a centrifugal machine used for dry grinding and the blending of liquids. The grinding medium consists of two steel discs, one above the other in the manner of millstones. The discs are fitted with a large number of the hardest manganese steel pins, arranged in concentric circles, the lower disc rotating, whilst the top one is stationary. The pins in each disc intercolate, and as the machine runs at a high speed, its grinding area is in effect equal to very large millstones or set of rolls.

The grinding discs and circular discharge ring are so constructed that the material is freely discharged, the inflow of air and fan-like action of the rotary disc keeping the material cool, so that products of low melting point, such as resin, glue, waxes, cocoa, sugar, etc., can be rapidly ground to powder with practically no risk of clogging. Various degrees of fineness are obtained by changing the discs. Those with a large number of pins give a fine product, while those with a few pins give a coarse product.

The bottom disc is fitted to the top of a vertical spindle mounted in ball thrust and journal bearings, and rotates at a high speed. In the lower end of the verticle spindle is cut a multiple start worm thread, and the worm is driven by a phosphor bronze worm wheel which is keyed to a horizontal shaft carrying a driving pulley or a coupling for an electric motor. The worm wheel driving the worm increases the speed of the vertical shaft to six times that of the horizontal driving shaft and is enclosed in a vertical housing, which acts as an oil bath.

The material to be ground or blended is fed into a tundish which fits into the centre of the stationary disc, and enters the space between the stationary and rotating discs. It is then driven outwards by the centrifugal force, and passes between the numerous stationary and moving pins, which do their work of grinding and mixing. The material is then free to leave the discs at the periphery, and enters a circular steel receiving bin so designed that no dust flies about during the milling. The product is removed from the bin at the bottom. At the top of the bin there is a large cover held in position by swivel bolts, which allow for its quick removal for cleaning, etc. In this cover there is a short funnel for attaching a dust catcher when dry gridding.

This machine is made in three sizes. The first is the largest, having 26 in. diameter grinding discs, and is able to handle 18 to 30 cwt. of material per hour, the rate of production depending on the nature of the stock treated. It absorbs 20 to 30 h.p. at 600 to 900 r.p.m. on the driving shaft. The second size has 13 in. diameter grinding discs, and is capable of handling average material at the rate of 8 to 9 cwt. per hour. It requires 7 to 10 h.p. and the driving shaft runs at 800 to 1,200 r.p.m. The third size has 7 in. diameter discs, absorbs 3 to 4 h.p. at 1,200 to 1,350 r.p.m. on the driving shaft. Approximate output of material averages $1\frac{1}{2}$ cwt. to 2 cwt per hour.

The "Circulator" Mill

The "Circulator" Mill is used for wet grinding, blending, and colloiding. Its action is centrifugal, but instead of the spindle to which the grinding ring is fastened being vertical, as in the "Kek" Mill, it is in a horizontal position, and runs in self-oiling phosphor bronze bearing being driven by belt or direct by electric motor. The mill head consists of an enamelled cast iron hopper, conical in shape, and is fastened to the centre of a removable circular cover, which acts as the casing around the grinding rings.

Keyed to the end of the horizontal shaft is what is known as the driving plate, and it is to this plate that the rotating grinding ring is fastened, being held by four countersunk bolts. The stationary ring is bolted to the inside of the removable casing, and has a large hole in the centre of it, which allows for the admission of the liquors from the feeding hopper into the mill. The rings are identical in shape and detail, therefore interchangeable, and have a number of grooves cut in them, so designed as to work in conjunction with the eye of the rings, but they do not extend as far as the outer edge of the rings, this edge being a ground flat surface. The rotating ring is adjustable to allow for some liquors which require to be milled with the rings "touching," others require them open, say, one, two, or three-thousandth part of an inch. The adjustment of the rings is obtained by the operation of a patented worm and worm wheel, and is provided with a calibrated scale, showing the distance between the grinding rings in divisions equal to one thousandth part of an inch.

The grinding rings are of various forms—smooth, heavy grooved, fine grooved, curved grooved, etc.—and are made of dead hard special cast steel too hard to machine. Special metals, such as phosphor bronze, stainless steel, etc., as well as granite and other stones, can be used in the plate construction when necessary.

The liquor to be milled is poured into the enamelled hopper and thence enters into the centre of the grinding rings and, after being thoroughly milled, is discharged into the casing around the rings. It is then subjected to a violent agitation before leaving the mill through the top, side or bottom cocks.

Liquids that cannot be reduced in once through may be allowed to pass through the mill rings over and over again by simply opening the top circulating cock. Running speed varies according to materials operated. Fine grinding in water is usually accomplished at high speed ranging from 700 r.p.m. to 2,000 r.p.m., but when the grinding materials are of volatile media, such as paints, enamels, etc., this can be considerably reduced with advantage in order to avoid overheating and loss of volatile ingredients, by evaporation generally as far as paint and enamels are concerned. The finer the product the slower the speed.

The Protection of Ironwork in Buildings

The Chemical and Practical Points of View

A joint meeting of the Oil and Colour Chemists' Association and the Borough Polytechnic Oil and Colour Students' Association was held at the Institute of Chemistry, London, on Thursday, March 13, Dr. J. J. Fox presiding. The discussion was opened by Mr. Arthur J. Castle, as a practical decorator (on behalf of the Student's Association) and Mr. J. N. Tervet replied on behalf of the Oil and Colour Chemists' Association.

MR. CASTLE said that as yet we had had few opportunities of ascertaining whether Portland cement mortar was capable of protecting from corrosion the mild steel skeletons of buildings which were covered with concrete, brickwork, or stonework, and time might prove that some protective film must be placed between the steel and the masonry, which film must be more elastic than Portland cement mortar and more impervious to moisture. If time proved that such a film was necessary, then the question arose as to the materials of which it should consist and how it could best be applied. He suggested that such a film would be a bituminous one.

Protecting Under and Overground Ironwork

With regard to underground ironwork, Dr. Angus Smith's solution, being tough and elastic, formed a very good protective coating for iron drains and water mains, but the application of additional coats of bituminous paints after the joints had been caulked should be considered seriously. The ironwork in underground buildings, where condensation occurred, had to be repainted constantly if the surfaces were to be kept free from rust. This suggested that galvanising was the only profitable treatment, even if it were necessary to apply coats of paint afterwards for decorative purposes. Some form of insulation was necessary for flushing tanks in lavatories, where condensation occurred in the winter months, and the best method was to incorporate cork dust in the paint films.

Very seldom were attempts made to protect the steelwork reinforcement in concrete foundations, apart from the application of a coat of red oxide paint, or the application of some other type of covering, such as cold galvanising. Either method had very little value, however, seeing that when the concrete was deposited around the reinforcement the abrasive action destroyed the films.

In ironwork above ground, all the elements had full play, and unless the protective film clung securely to the metal, and was flexible, in a very short time corrosion would commence under the film, small granules of rust would develop, and by expansion the film would be forced away from its anchorage and destroyed. Metal casements were sometimes sprayed or dipped to give them a coating of zinc to prevent rusting, but even metal work so treated required at least three coats of paint in order to provide sufficient protection for a period of, say, three years. Cast iron gutters and rain-water pipes were usually painted, but he was convinced that it would prove to be more economical in the long run to hot-galvanise them and to finish with one coat of paint to satisfy the decorative requirements. He suggested also that the time had arrived when serious attempts should be made to provide a more efficient protection for the insides of hot-water cylinders and tanks.

Bituminous and Aluminium Coatings

Dealing generally with the application of paint and other films for the protection of ironwork, he emphasised the importance of galvanising hot if the best value was to be obtained from galvanising. The value of Sherardising was not to be compared with that of galvanising.

Discussing the value of bituminous coatings, he advised all users never to specify cheap qualities of bitumen, because they contained a good deal of coarse gritty material which should never be present in bituminous paint, and in a short time the coatings corroded or oxidised and powdered off. The best types of bituminous solutions were really good. From personal experience he considered that two coats of bituminous solution on a clean surface were equal to four coats of paint, but it meant some sacrifice of the artistic effect.

As to the relative values of red lead and oxide paints, he would say every time that red lead was the best. With regard to aluminium paint, he had been experimenting for about twenty years on the rust-proofness of various types of coatings, and was satisfied that aluminium paint was a better rust-resister than either red lead, red oxide, or bituminous paint, but there must be three coats of it at least.

A Chemist's Views

Mr. Tervet, replying to some of the points raised by Mr. Castle, argued that it was problematical whether aluminium paint was better than red lead or red oxide paint. Also, he did not altogether agree that a bituminous coating would necessarily be better than red oxide paint, so much depended on the composition of the bituminous material, but a really good bituminous paint would probably outlast a red oxide paint which appeared to perish in three years. As to the use of bituminous coatings on the ironwork of the Panama Canal, it had been stated that, in view of the high temperature, soya bean oil was incorporated as one of the constituents of the final coating.

Ironwork under ground had to withstand the corrosive influences of stagnant or running water, soluble salts, soluble gases, air, carbon dioxide and decaying vegetation, any pair of which might be said to be sufficient to start corrosion of any exposed metal. The protective coating suitable to withstand these conditions must be of the type least liable to absorb water. Bituminous coatings would withstand continuous immersion in water remarkably well, did not oxidise rapidly, but were liable to be softened by decaying vegetation. They did not appear to prevent rust from creeping, once the film was damaged. A heavily pigmented paint with suitable pigment would withstand continuous immersion in water and salt solutions; by reason of its composition it was not liable

to be softened by decaying vegetation, and in the event of damage, creeping of rust was retarded.

Ironwork on the ground was subject to much the same corrosive influences, although the action was intermittent, and in addition, it was subjected to the action of frost. Thus, the protective coating had to withstand rapid changes of temperature, and must be elastic. Oil coatings need not be absolutely waterproof, provided the pigment in the paint in contact with the metal had rust-inhibiting properties. This might be ensured by the use of suitable primers pigmented with mixed chromates or compounds having basic properties. The former type, although of a protective character, required to be coated with another paint so that it did not suffer from exposure to climatic conditions. The highly pigmented paints were still very effective, even under the altered conditions, and were sufficiently elastic to yield to variation in temperatuie, and, having a tightly packed film, resisted the passage of moisture.

Ironwork above the ground was subjected to very severe conditions—rain, snow, frost, air, soluble salts, carbon dioxide, acid and ammonia fumes, and often to the action of strong sunlight. The range of temperatures being wider than that at ground level, elastic paints were essential, to withstand the contraction and expansion of the metal. In this group the preparatory work was almost as important as the paint itself. Long oil paints were indicated for the protection of ironwork in exposed parts, "Long Oil" being understood to mean that the volume of the oil was greatly in excess of the volume of the pigment.

The Chairman said it had been found during the war that there was no varnish coating for woodwork that was impervious to moisture, but the paint that came nearest to impermeability was aluminium paint with a medium of tung oil.

Dr. Jordan's Basic Theory

Dr. L. A. Jordan, discussing the mechanism of corrosion, said that the general principle of corrosion, and the so-called anti-corrosive paint idea, was based on the following fundamental facts. The true protective agent of steel and iron work was iron oxide itself, produced by the steel or iron. By that he did not mean the scale, *i.e.*, the lumpy sort of rust, but rather the tarnish which appeared on any bright metal surface when exposed to the atmosphere. The task of the paint manufacturer or user was to prevent damage to that film which the metal had provided for itself. If he succeeded in that, he had for the most part succeeded in protecting the metal. If the tarnish film was damaged, the metal sought to repair it; when the metal failed to repair the damage, one tried to repair it in the paint film applied. For that reason, priming coats were particularly successful when they contained the oxidising agents. He was not sure that, as had been suggested, corrosion troubles were due to the formation of rust underneath the paint film and the pushing off of the film. He rather inclined to the view that first there was loss of adhesion between the paint film and the metal, and that rust subsequently filled up the space.

Mr. H. J. Woods pointed out that the ironwork in the tube railways did not rust, because the temperature was maintained at a satisfactory level; the temperature was maintained at about 50° or 60° F. all the year round, so that it was not necessary to coat the ironwork. In reinforced concrete work, if the concrete was of sufficient thickness, so that the iron was kept absolutely free from air, there should be no cause for alarm.

Mr. Douglas Wait (President of the Borough Oil and Colour Students' Association), discussing the preservation of iron in reinforced concrete structures, said he had had occasion to visit the first big building of reinforced concrete in Newcastle-on-Tyne some years ago, and had suggested the painting of the iron. The engineer responsible, however, had shown him the results of some experiments in which new iron, not prepared in any way, had been embedded in concrete, and had said that the natural scale on the iron had formed calcium ferrite with the lime in the cement, and that had percolated into the cement and had left clean iron, which did not rust subsequently.

Mr. Castle, replying to the discussion, commented first upon a point made with regard to the marketing of inferior paints, and said that until the manufacturers of paint in this country were prepared to co-operate sufficiently to insist that every tin of paint sold should be labelled, they could not throw stones at the painters. With regard to the rusting of iron, his experience was that the more steel-like it was, the more susceptible it was to rust; the more it conformed to the original iron that was made on the old Sussex hearths, and the more it was hammered by the blacksmith, the longer would it resist rust.

A Matter of "Confidence"

To the Editor of THE CHEMICAL AGE.

SIR,—May I ask the hospitality of your columns to warn brother chemists of the danger of falling into a trap? The plan is quite simple. An advertisement is inserted for a chemist to undertake certain work in the nature of building up a business with very good prospects attached. He is then persuaded to accept the appointment at a low commencing salary with a series of rises, usually £50 per annum extending over a period of anything up to five or seven years, and a legal agreement, but with the proviso that, as the matter is extremely urgent, he must resign his present post forthwith, in order to be able to join his new employer as quickly as possible, and the hope is expressed that he will have "confidence" that matters will be settled to his satisfaction as soon as possible.

In one case I was engaged at £450-£500-£550-£600 on a written promise of a legal agreement for the mutual protection of myself and the company, but my immediate acceptance was necessary. After my successor had been appointed by my old firm I was asked to forgo the "legal agreement" as it was after all "a matter of mutual confidence," and neither party would wish to be bound to the other if we found that we did not agree, so that it would be better if we left it that we could part at a month's notice, if circumstances arose which rendered it desirable. I dropped into the trap and my employers, when they were satisfied with the knowledge I could give them, saw that "circumstances arose," so that I tendered my resignation. I believe that I was the eighth chemist to leave in about ten years.

This last week, being in a temporary post terminable at short notice, for the present, I was engaged by the director of a company at the rate of £500-£550-£600-£650-£700-£750, after I had asked in writing for a commencing salary of £600 per annum, but an agreement was to be drawn up and posted to me "to-night," so that I could tender my resignation immediately to join the new firm. I did not resign forthwith, but waited for the agreement, which did not turn up. Consequently I phoned the prospective employer, but no message could reach him, and I wrote to him that I could not see my way clear to resign my present post until I had the appointment confirmed in writing, together with the promise of the agreement. This brought a reply per return, with a lot of explanation as to the reason why no agreement had been sent, and confirming the appointment at £500-£525-£550-£575-£600, terminable at a month's notice, and requesting that I should have "sufficient confidence" to resign my present post before the agreement was drawn up. I managed to get the gentleman on the phone. When I suggested that an agreement should give three months' notice, at least, on either side, words became rather excited and eventually I was asked if I would prefer to call it off, as there were plenty of other people willing to take the job. I thought it desirable to "call it off."

I happen to know that I am not the only person who has been bitten in this way, as professional men have been stranded abroad by means of this method, and more than one professional body have now advised their members officially not to accept an engagement overseas, without submitting the agreement to them for perusal. It behoves chemists to take care that they do not resign one post until the next one is absolutely assured.—I am, etc.,

"ONCE BITTEN, TWICE SHY."

British Interests in Chilean Sulphur

SULPHUR is produced in the Arica district, near the Tacora volcano, as indicated by the shipment of 1,735 metric tons during the quarter ended December 31, 1929. It is reported, the U.S.A. Vice-Consul states, that a British company is interested in acquiring the sulphur deposits in the Arica district.

The Hardness of Electrodeposits

Comparison of Tests

An interesting paper on "The Hardness and the Polishing of Electrodeposits" was read by D. J. Macnaughton and A. W. Hothersall of the Research Department, Woolwich Arsenal, before the Electro-Platers and Depositors' Technical Society, and provoked a lively discussion.

The methods that have been developed for testing the hardness of metals may be divided roughly, it was stated, into indentation tests and abrasion or wear tests. Two forms of indentation test which are in common use for determining the hardness of metals are the Brinell test and the Scleroscope test. Scratch tests, which are not strictly indentation tests, when applied so as to cause abrasion along the scratch as in early used methods (and frequently as at present applied to minerals), have become in the modern form of the test, as applied to metals, an indentation test, since the scratch is formed by flowing the material and not abrading it.

In the usually adopted scratch test, the specimen is moved horizontally under a diamond or sapphire scratching point which is pressed by a definite load into the surface of the specimen, the degree of hardness being indicated by the width of the scratch thus produced, the narrower the width the harder the material. A serious disadvantage of this test is the difficulty of obtaining comparable results with different scratch testing instruments. Even with a single instrument considerable alteration of the cutting edges of the scratching point may occur during use, so that recalibration is necessary from time to time. A further drawback is the very slight change in width of scratch which corresponds to a large change of hardness.

Brinell Hardness Range

In view of these drawbacks to scratch tests the authors have preferred to employ the Brinell hardness test wherever possible, and the results previously published by the authors, together with further figures which they have more recently obtained, are given in the following table :—

Electrodeposited Metal.	Brinell Hardness Range.
Lead	3—5
Cadmium	12—53
Zinc	40—50
Silver	61—130
Copper	58—150
Iron	167—350
Nickel	155—420
Cobalt	270—311
Chromium	500—900

Comparison of the results of these hardness tests of electrodeposited metals with those of the same metals when produced by the usual metallurgical methods, indicates that whilst in general no great difference exists between the order of hardness in both cases, certain notable exceptions are found which indicate the peculiar properties of electrodeposits. Thus, for example, chromium deposits have an extremely high hardness reaching that of fully hardened alloy tool steels, yet recent work has shown that this metal when prepared in pure form by metallurgical methods has a hardness not greatly different from that of copper. Nickel as metallurgically produced has a hardness of the order of that of mild steel, whereas it has been shown that electrodeposited nickel may have a much higher hardness.

The authors' abrasion tests demonstrate that although no relationship is established between Brinell hardness and resistance to wear, deposited metals fall into approximately the same order when classified according to their resistance to abrasion as when arranged according to their Brinell hardness number.

Effect of Polishing

Rayleigh, Osmond and Beilby, have shown that an essential feature of the polishing process is the formation of a mobile film which is flowed over the surface of the material. Thus Beilby demonstrated that even in the case of a hard, brittle material, such as speculum metal, light polishing with the finger or with a soft leather applied by hand is capable of imparting temporary mobility to a surface layer of molecular thickness which, while in the mobile condition, behaves like a viscous liquid. This mobile layer is readily flowed over scratches and other slight imperfections in the surface, and being smoothed out by surface tension forces, produces the mirror-like surface of a liquid which would appear to be the essential condition of polish. The existence below a polished surface of scratches covered over by the flowed film was demonstrated by Beilby by light etching which dissolved away the film and revealed the scratches which had been visible prior to polishing.

In previous publications the authors have shown that, using identical depositing conditions, it is possible to produce two well-defined types of nickel deposit of widely different mechanical properties from two different types of depositing solutions. Thus, using salts and anodes of high purity, hard deposits with an average Brinell hardness number of about 300 were produced from solutions of the following composition containing ammonium salts : nickel sulphate 70–120 grams, ammonium sulphate 21 grams, potassium chloride 8–20 grams per litre, whilst using similar depositing conditions, soft deposits with an average Brinell hardness number of about 150 were produced in solutions of the following composition, containing no ammonium salts : nickel sulphate 70–240 grams, boric acid 30 grams, potassium chloride 8–20 grams per litre.

On the other hand, Sizelove has recommended the addition of ammonium salts to nickel baths to secure soft deposits, and it would appear from statements by Messrs. Canning and Co., made with respect to the properties of nickel deposits obtained from two types of solution, the broad distinction between which may be said to lie in the presence of ammonium salts in the one and not the other, that the solution containing ammonium salts yields softer deposits than the solution in which these salts are absent.

Evidence is then adduced in the paper to show that the views held concerning the hardness of nickel deposits which are based on quantitative tests, and the contrary views expressed by Sizelove and Canning, which would appear to be based upon the behaviour of the deposit during polishing, may be reconciled if it is accepted that ease of polishing, instead of being indicative of softness, is actually in this case indicative of hardness with associated smoothness.

Easter Excursions to Belgium

The Belgian National Railways announce that cheap Easter 15-day excursion tickets will be issued daily from April 16 until April 21 from London and Dover to Ostend, Bruges, Brussels, Antwerp, Liége, Hergenrath, etc. Passports are essential. In addition, the week-end tickets (without passports) will be specially available for use by the night service leaving Victoria at 11 p.m. on Thursday, April 17, and returning up to the following Tuesday afternoon. The return fares to Ostend are as follows :

From London : 15-day excursion tickets : 1st rail and boat, £3 1s. 7d. ; 2nd rail, 1st boat, £2 7s. 11d. ; 2nd rail, and boat, £2 2s. 3d. ; 3rd rail, 1st boat, £1 16s. 7d. ; 3rd rail, 2nd boat, £1 10s. 11d. Week-end tickets : 1st rail and boat, £2 19s. 7d. ; 2nd rail, 1st boat, £2 6s. 7d. ; 2nd rail and boat, £2 0s. 11d. ; 3rd rail, 1st boat, £1 15s. 9d. ; 3rd rail, 2nd boat, £1 10s. 1d.

From Dover : 15-day excursion tickets : £1 0s. 1d. and 14s. 7d. Week-end tickets : £1 0s. 4d. and 14s. 10d.

For a few shillings extra, excursion tickets can be issued to Bruges, Ghent, Brussels, Antwerp, Hergenrath, Dinant, Braine l'Alleud and Liége.

Similar tickets to those mentioned above will also be issued : On April 7/8, in connection with the Brussels Commercial Fair ; on April 25/26, in connection with the Antwerp Exhibition ; and on May 1/2, in connection with the Liége Exhibition.

Optical Society's New Officers

The annual general meeting of the Optical Society will take place on April 10, when a new Council for the year will be elected. Officers and ordinary members of the Council recommended are :—President : F. Twyman ; Vice-Presidents : D. Baxandall, E. F. Fincham, J. Guild, Professor A. F. C. Pollard ; Hon. Treasurer : Major E. O. Henrici ; Hon. Secretaries : W. B. Coutts, A. Whitwell ; Hon. Librarian : J. H. Sutcliffe ; Editor of Transactions and Assistant Secretary : J. J. Hedges ; Council : J. S. Anderson, W. B. Barker, T. Chaundy, C. V. Drysdale, S. A. Emerson, W. Gamble, W. M. Hampton, E. T. Hanson, J. W. Hasselkus, Professor A. O. Rankine, C. L. Redding, and R. S. Whipple.

Fatigue Failure of Steels

Effects of Chemical Action

ADDRESSING the members of the Birmingham Section of the Society of Chemical Industry on Thursday, on "Chemical Action in Relation to Fatigue of Steels," Dr. R. W. Ormandy said that the study of the fatigue of metals, which might be defined as the behaviour of metals under repeated cycles of stress, began to be important when railways came into existence. The present day growing utilisation of higher speeds for the production of greater power with less weight was making the study of ever greater importance. The higher temperatures employed, as in turbines and in internal combustion engines, were introducing further complications because, whereas in earlier days the relationships sought were primarily those between fatigue stress and either ultimate or yield strength of the metals, we now had to bring into consideration the factors associated with the "creeping" of metals under stress at high temperatures.

Chemical Industry Demands

The chemical industry was calling for high speed and resistant materials working under exceedingly onerous conditions, and the discovery first made by Professor Haigh that the fatigue behaviour of metals was influenced in an unexpected degree by the surroundings to which the metal was exposed had opened up a new field of research.

Dr. Ormandy began by describing briefly the Wohler and Haigh types of testing machines, and described the means commonly used for expressing the results of experiments with these machines. A number of diagrams were shown illustrating the typical behaviour of a mild steel in comparison with a high alloy steel. The rapidity of the change in the cycle was briefly referred to, as was also the behaviour of test pieces under varying temperature conditions.

The author pointed out that all the results so far referred to had been obtained by testing samples under atmospheric conditions. He then dealt, at some length, with the work of Haigh, Lehmann and McAdam on the influence of various chemicals, distilled water, sea water, ammonia, sodium nitrate solution, ammonium chloride solution, lubricating oil, etc.

A number of interesting points were emphasised, such as that in the Wohler test corrosion of the sample increased along the length of the piece, becoming most pronounced where the stresses were the greatest. It was shown that mere rotation of the sample without stress in some environments led to earlier failure when the sample was subsequently tested under load. It was pointed out how certain metals were resistant to certain chemical actions whilst very sensitive to others.

Aluminium Crystals

Attention was next directed to the fascinating work carried out at the National Physical Laboratory by Gough and others on the behaviour of single crystals of aluminium under fatigue conditions. A brief reference was made to crystal structure and the tendency of crystalline materials to yield or slip along the lines of closest atomic packing. The fact that slip was accompanied by hardening was then dealt with and the theories of Beilby and others to explain this were referred to.

It was pointed out that the tensile strength of apparently perfect crystals was a mere fraction of that which might be expected, and the explanation had been tendered that all crystals were full of sub-microscopic cracks caused, to some extent, by the internal atomic pull endeavouring to reduce the surface area to a minimum.

Beilby's work on the flow of crystalline material was briefly touched upon and examples quoted of the attraction existing between clean faces brought into intimate contact and of the directional force exerted by atoms in a crystal lattice acting over considerable distances. The possibility of a gradual penetration of extraneous material into microscopic and even sub-microscopic spaces, such as those existing along slip planes in the crystal substance was then dealt with and selective adsorption, molecular polarity, and molecular dimensions were briefly touched upon as having a possible bearing on the results referred to.

In conclusion the author pointed out that although the subject dealt with might appear, at first glance, somewhat remote from the activities of the Society of Chemical Industry, there was nevertheless a very direct and practical bearing. He expressed his thanks to Professor Haigh for the loan of a number of lantern slides, and to Dr. Gough, of the National Physical Laboratory, and Dr. Rideal, of Cambridge, for valuable help.

Fate of Safeguarding Duties

Sir W. Alexander's Plain Words to Politicians

SECONDING a resolution against the withdrawal of safeguarding duties, proposed by Sir Robert Horne at a meeting convened by the National Union of Manufacturers at Westminster on Thursday, March 13, Brig.-General Sir William Alexander, M.P., said that as a result of acute depression in our main industries and the recent alarming increase in unemployment figures, this country had at last realised that the worst doctor for the disease was the politician. Since the war we had paid dearly for Government interference and administration in vast commercial problems affecting not only the welfare of the nation, but that of the Empire.

Much of the retardation in getting back to prosperity could be laid to the charge of Government procedure and methods. The House of Commons, with comparatively few exceptions, did not attract the best commercial and financial brains. Our industries were compelled to compete under crippling legislation introduced largely for party purposes by those who were politicians first and practical commercial men last. The country was sick and tired of election pledges for the relief of industry and unemployment, and at the next election those who had the true welfare of our Empire at heart would demand more business and less politics.

They had within the Empire all the essentials of progress and prosperity if Governments would leave commercial matters to commercial men, confining themselves to such legislation and economies as would assist. One function a Government could perform: it could hold the ring to see that our industries and workers got a fair field against unfair tactics. Great achievements were possible within the confines of the Empire by mutual trading agreements on a "give and take" basis. He asked the meeting to support the policy they had in view, so that the Government might realise that the country viewed with the greatest alarm the possibility of the rescinding of duties which had proved to be in every sense beneficial to the trade and employment of the country.

New Benn Books

RECENT publications by Ernest Benn, Limited, include the following:

Benn's Sixpenny Library: *Ants*, by Julian Huxley, No. 142; *The Renaissance*, by E. F. Jacob, No. 146; *British Prime Ministers of the Nineteenth Century*, by F. J. C. Hearnshaw, No. 147; *History of Medicine*, by R. McNair Wilson, No. 148; *Archæology*, by Stanley Casson, No. 149; *The Polar Regions*, by F. Debenham, No. 150.

Benn's Essex Library (3s. 6d. net): *George the Fourth*, by Shane Leslie; *She-Shanties*, by A. P. Herbert; first cheap editions: *Far Enough*, by Helen Ashton; *The Lay Confessor*, by Stephen Graham; *The Partnership*, by Phyllis E. Bentley; *East All the Way*, by J. G. Lockhart; *The Sword and the Spirit*, by Beatrice Sheepshanks; *Who Opened the Door?* by Thomas Cobb; *The Boy Prophet*, by Edmund Fleg; *The Gateway of the World*, by Katharine Claire Perris; *The Man Behind the Mask*, by Grace MacGowan Cooke.

Norske Hydro Fertiliser Production

THE Norske Hydro Co., since its agreement with the I.G. Farbenindustrie in July, 1927, has ranked second on the international market for the production of nitrogenous fertilisers. Now that the Haber process is employed in all this company's plants, the production capacity has reached nearly 90,000 metric tons of fixed nitrogen annually, representing approximately 500,000 metric tons of fertiliser salts in the form of sulphate, ammonium nitrates, and calcium nitrate. Annual exports of fertilisers by the Norske Hydro are estimated to amount to 80 million crowns in value. It is expected that this figure will reach 130 million crowns as soon as the new installations, now under construction, have begun operation. The company is a party to the international nitrogen agreement.

Indian Chemical Notes

(From Our Indian Correspondent.)

Demand for Coal Research

Speaking at the annual dinner of the Mining and Geological Institute of India at Calcutta, the President of the Institute (Mr. J. Thomas) put in a strong plea for the creation of the Coal Industry Research Board that would co-ordinate the work of different committees and avoid duplication of effort. The Board should be appointed by the Central Government and sub-committees should be formed to deal with each subject. The subjects for investigation were coal dust explosions, cause and control of subsidence, fires and collapses, cleaning and marketing of coal, and scientific utilisation of coal. The Member for Industry (Government of India) who was present on the occasion, stated in reply that the Government are themselves considering some such scheme and their proposals are being framed. There would be some difficulty about financial arrangements.

Indian Industry

The report of the working of the Dharamsi Morarji Chemical Co. for the past year shows a loss of more than a lakh of rupees. The principal causes that have contributed to this loss are the protracted mill strike in the Bombay cotton industry, extending over a period of six months and the very severe foreign competition in most of the salts. During the year under review, the manufacture of the commercial acids, pure acids, and pure salts and fertilisers was continued while the manufacture of commercial acids was suspended owing to foreign competition. The question of protection to the industry was considered by the Tariff Board, who have already submitted their report to the Government of India. The publication of the report, with the decision of Government thereon, is being anxiously awaited.

Milk Products

What may be called an important venture in India is the newly-established dairy at a place called Anand in the Bombay Presidency on the most modern lines. The factory is fully equipped for the production of at least 5,000 lb. of butter daily to meet the existing demand. It is also equipped to handle separated milk from 70,000 lb. in weight to 100,000 lb. for the production of casein and its by-products. Attached to the dairy is a completely equipped laboratory with all modern testing apparatus working by gas and electricity. The factory also manufactures casein glue, for which there is a good demand in India by railways, who utilise it extensively in the building of carriages. It is also used in the manufacture of three-ply wood. The factory is under the guidance of a German expert.

Institute of Science

The Indian Institute of Science, Bangalore, made considerable progress in research work during the past year. In the department of general and organic chemistry, subjects receiving attention and having prospective industrial interest are: (1) the composition of Bhadravati wood tar for conversion into disinfectants and lamp black and for utilisation as a road surface material. (2) The effect of sunlight and climatic conditions on dyed fabrics. (3) The relative efficiency of catalysis in the manufacture of sulphuric acid. (4) Examination of several typical dry cells. (5) Comparison of West Australian and Mysore sandal wood oil, and (6) A search for new sources of santonin.

Beryl in India

In India, beryl occurs as an accessory mineral in the course of mica pegmatites of Bihar and Orissa, Nellore and Kishemgarh, but no attention has yet been given to it. It is difficult to estimate what the annual production of beryl in India might be from the mica pegmatites, but Dr. Fox and Mr. Hobson of the Geological Survey of India estimate an annual production of 3–4 tons from the Koderma Forest Area in Bihar and Orissa and 5 tons from the mica belt in Nellore in the Madras Presidency. It is also understood that several tons of weathered-out beryl could be collected from the slopes of the hills which run north from Ajmere to Narwar in Kishengarh. Mr. Clegg, of the Geological Survey, has drawn the attention of the mica organisations to a possible use of beryl, which is at present a waste product.

Chemical Matters in Parliament

Imported Margarine Oils

Mr. McKinlay (House of Commons, March 18) asked the Secretary of State for Scotland whether he is aware that imports to Scotland of oleo oil and oleo stearine used in margarine must be accompanied by a certificate that the fat was derived from an animal free from disease; whether he is aware that no such health regulations are observed on imports to England; whether any Scottish authorities have complained of their precaution being defeated by imports via England; and whether he will make any representations on the subject to the Government.

Mr. Johnston: I am aware that the practice in this matter at Scottish ports differs from that observed at English ports, and consultation is taking place with the Minister of Health on the subject, with a view to securing the adoption of a common practice.

White Spirit Duty

Mr. Culverwell (House of Commons, March 13) asked the Chancellor of the Exchequer whether, now that it is possible to treat white spirit for use in the paint trade so as to distinguish it from white spirit for any other use, he will consider the abolition of the duty on this spirit?

Mr. P. Snowden replied that on his present information he could not accept the assumption in the question.

Phosphorus in Coal and Coke

Some Methods of Determination

Phosphorus is usually determined in coal and coke by the ammonium molybdate method whereby that element is precipitated as ammonium phosphomolybdate. The presence of enough titanium may retard the complete precipitation of the phosphorus, thus giving low results. Coal and coke may contain sufficient titanium to cause considerable error in the phosphorus determination.

A number of coal ashes covering a wide range in phosphorus content were analysed by three different methods at the Pittsburgh Experiment Station of the United States Bureau of Mines. One method consisted of fusing the ash with sodium carbonate and leaching the fusion with water; in this scheme the titanium is removed as it is not water-soluble. Two fusions with sodium carbonate were sufficient to get all of the phosphorus into solution. The method, although rather long, due to the two sodium carbonate fusions, gives satisfactory results.

A shorter method tried is one in which the ash is treated direct with nitric and hydrofluoric acids to decompose the ash and get the phosphorus into solution. Although this procedure does not remove the titanium, it gave results checking closely for all ashes tested with the sodium carbonate-fusion method. Some coals and cokes may contain sufficient titanium to cause trouble, but the method apparently is satisfactory for coals not abnormally high in titanium. The method is considerably more rapid than the sodium carbonate-fusion method.

Another method tried consisted of treating the ash direct with hydrochloric acid, fusing the insoluble residue with sodium carbonate, and then dissolving the fusion in dilute hydrochloric acid. This procedure is frequently used for iron ores. The method did not prove satisfactory as difficulty was experienced in the complete precipitation of the phosphorus, due to interference of titanium. The phosphorus was incompletely precipitated and the results obtained were too low for most of the coals tested.

Foreign Bitumen Imports

According to the Board of Trade Returns issued on Wednesday, 13,565 tons of foreign bitumen were imported into this country during February. This is an increase of over 500 tons on the figures for January and brings this country's expenditure for bitumen during the first two months of 1930 up to £126,052. In addition to these imports, large quantities of bitumen are distilled annually in this country by foreign oil companies from imported petroleum in the process of manufacture of lubricating oils and petrol and are used on British roads instead of British materials such as tar.

From Week to Week

MESSRS. ANTON JURGENS, Albert Van den Bergh, Donald Van den Bergh, and Paul Rykens and Dr. Heinrich Schicht have been appointed directors of Lever Brothers, Ltd.

CLOUGHFOLD and Rawtenstall (Lancashire) works of the Cotton Cellulose Co., which produces materials used in the manufacture of gun-cotton and artificial silk, is closing down indefinitely, owing, it is stated, to foreign competition.

UNIVERSITY NEWS.—*Liverpool:* The Council and Senate have agreed to confer, at a Special Congregation to be held on June 5, an Honorary degree of Doctor of Science on Dr. George Barger, Professor of Chemistry in relation to Medicine, University of Edinburgh.

MR. B. S. ADDERLEY, who has been secretary of British Glues and Chemicals, Ltd., since 1921, and who was appointed a director some little time ago, has relinquished the secretaryship in order to undertake other important duties for the company. Mr. W. Town, the assistant secretary, has been appointed secretary.

DR. A. SCOTT, chief assistant to Dr. J. W. Mellor, in the Pottery Department of the North Staffordshire Technical College, tendered his resignation at a meeting of the governors last week. The board accepted a gift from Mr. H. V. Thompson, head of the Chemistry Department, of 16 steel engravings of eminent chemists. These will be hung in the chemistry lecture room.

DR. HAROLD WARD DUDLEY, who has been made a Fellow of the Royal Society, is a former student and member of the chemical staff of Leeds University. After important work on the structure of proteins in Dr. Dakin's laboratory in New York, he was appointed lecturer in biochemistry at Leeds in 1913, and later became research chemist to the Institute of Medical Research at Hampstead.

A FLOURISIHING PERFUME FACTORY has been set up in the Australian orange country by two British chemists, who during the war were captured by the Germans and set to work in a Cologne perfume works. Although no formulæ were disclosed, it is stated that the men, one of whom was an Australian, found that orange blossom was the essential element in the distillation, and learned enough to reproduce one of the most famous brands of Eau de Cologne.

A PROPOSAL to employ a chemist at Warrington Gas Works formed the subject of considerable discussion at the last meeting of the Urban Council. Replying to members who suggested that it was possible for untrained persons to use scientific instruments recently installed at the works, Dr. Latham said: "I often think that if we had dealt with this subject years ago, as we ought to have done, we would have won the war much sooner than we did, and would not now be sending out gas which can be used safely for so many suicides. If we had had a suitable chemist, we would have avoided many of our troubles."

THE REPORT of the Departmental Committee on the Poisons and Pharmacy Acts, which has been sitting since 1926, was issued on Monday, with a minority report by Mr. F. W. Gamble and a reservation by Mr. A. E. Young, chairman of the Retail Pharmacists' Union. It is proposed that the control of the sale of poisons should rest with the Home Secretary, assisted by an advisory poisons board, and another section, to which some opposition has already been expressed, proposes that poisons in Part II of the Poisons List (substances used in agriculture and horticulture and as sheep dip) may be sold by unauthorised sellers registered by the local authority.

DROITWICH SPA BATHS, the brine rights over 3,000 acres, and the right to produce the well-known wychia water, have been sold by the Droitwich Development Corporation, Ltd., to a purchaser whose name is not disclosed. It is understood that the baths are to undergo extensive reconstruction in order to enable them to cope with the increasing demands made by visitors. Since acquiring the estate of the late Mr. John Corbett, who was largely responsible for bringing the properties of Droitwich brine to the attention of the public, the Development Corporation has parted with various residences, shop properties, and building sites. The Salters' Hall has been bought by Mr. T. A. Everton, an ex-Mayor of Droitwich.

EXTENSIVE BURNS were sustained by a workman named William Bates, of Wolverhampton, who, whilst working at the Union Steel and Manufacturing Company's premises, slipped and fell into a vat containing dilute sulphuric acid.

THE INSTITUTION OF CHEMICAL ENGINEERS is holding its eighth annual corporate meeting and annual dinner on Friday, April 4, at the Hotel Victoria, London, W.C.2. There will also be a meeting on April 3 at St. Ermin's, Caxton Street, Westminster, S.W.1.

THE PYRENE COMPANY, LTD., requests that in future all correspondence and goods should be addressed to the new building, in Great West Road, Brentford, Middlesex, where the head office, works, warehouse and dispatch departments will all operate.

THE SKELETON of a Roman soldier was discovered recently in excavations on the site of the new Thames House, at Millbank, London, S.W., and has been presented to the Royal College of Surgeons. It has been decided that it probably dates from about A.D. 200, when Severus invaded Britain.

THE DIRECTORS AND STAFF of the London office of Graesser Monsanto Chemical Works, Ltd., sat down to a very enjoyable dinner on Tuesday evening at the Hotel Belgravia. This was arranged to welcome Mr. John G. Gillis, who was recently appointed vice-chairman of the English company.

THE CENTENARY of the British Association for the Advancement of Science falls next year, when the meetings will be held in London from September 23 to 30. General Smuts has accepted the Council's nomination for the Presidency. The British Association will meet at Bristol this year under the presidency of Dr. F. O. Bower, Emeritus Professor of Botany in the University of Glasgow.

A CATCH OF WHALES producing 232,800 barrels of oil, valued at £970,000 is reported for the first twenty-one weeks of the 1929-30 Antarctic season, ended March 15, by Anglo-Norwegian Holdings, Ltd., the largest British unit in the whaling industry, for the fleets it controls. This catch represents an increase of 70,000 barrels, valued at £291,665, as compared with the figures for the same period last year.

RECENT WILLS include: Mr. Henry Richard Arnold, of Landaras, Hatch, Middlesex, governing director of Burgoyne, Burbidges, and Co., Ltd., manufacturing chemists, of East Ham, London, E. (net personalty, £116,411), £124,591; Mr. Keshav Balkrishna Mavlankar, of Wandsworth, and Yiewsley, proprietor of the British Aromatic Chemical Works (net personalty, nil), £41,922; Mr. A. W. Wardrop, Kilmalcolm, Renfrew, chemical merchant (personal estate in Great Britain), £13,589.

THE BOARD OF METAFILTERS (1920), LTD., have accepted the resignation of Admiral Sir Reginald Hall, who has been ordered abroad owing to ill-health. Mr. R. W. R. Law has also intimated his wish to resign from the board, as his whole-time brewery duties precluded his devoting effective attention to the company's affairs. In conjunction with these resignations, it was decided to terminate the recent appointment of Mr. Robert Steele as assistant managing director, and, pending other arrangements, to leave the management under the control of Mr. J. A. Pickard, as before. The remaining directors are Messrs. M. J. H. Brown, S. H. Buxton, H. E. Howard Tripp, and J. Parker.

Obituary

MR. J. JONES, Widnes, for 47 years with the Muspratt Works, March 5, aged 70.

SIR ROBERT HARVEY, of Dundridge, Totnes, High Sheriff of Cornwall, and one of the pioneers of the Chilean Nitrate industry, on March 14, aged 82. From 1875 to 1881 he was inspector-general of the nitrate fields in Tarapaca for the Peruvian and Chilean governments and later entered into partnership with the late Col. North. The Institute of Civil Engineers conferred the Telford premium on him in connection with his description of the iodine works which he designed and erected at Oficina, Pertana. He also completed extensive nitrate works at Buen Retiro, and the works of the Liverpool Nitrate Company at Iquique, besides playing a leading part in the development of South American industries by the construction of railways and waterworks. He was chairman of the Nitrate Railways, Ltd., the Antofagasta, Chili, and Bolivia Railway, Ltd., the Aranes Co., Ltd., the Tarapaca Waterworks Co., and several nitrate-producing companies.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

323,919. Pure Sulphur, Production of. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, January 7, 1929.

Pure sulphur is obtained by heating ammonium polysulphide solutions to 118° C., the impurities remaining in colloidal solution. The remaining ammonium polysulphide is then heated further to obtain sulphur of less purity. Ammonium polysulphide solutions is heated in a pressure-tight vessel D^1

FIG. 1

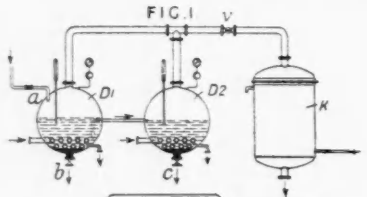
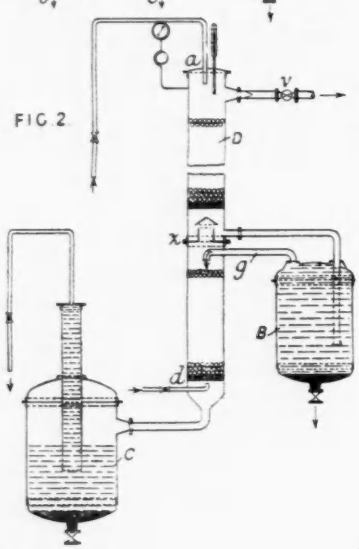


FIG. 2



323,919

and pure sulphur is drawn off at *b*. Ammonium sulphide distils and is condensed in vessel K. The polysulphide is transferred to vessel D^2 and further heated, impure sulphur being drawn off at *c*. The pressure is regulated by a valve *v*. In another apparatus, the polysulphides enter a column D at *a* and are heated by a counter-current of steam from *d*. Pure sulphur settles on a tray *z* and passes into a receiver B, while ammonium sulphide distils off at *v*. The polysulphides are returned to the column at *g*, and impure sulphur and water are collected in a vessel *c*.

323,908. Recovery of Sulphur from Alkali Metal Polysulphides. J. Y. Johnson, London. From $I.G^1$ Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany Application date, December 31, 1928.

Alkali metal or ammonium polysulphide is heated in a closed vessel to 150°-374° C. to expel sulphur.

323,973. Synthetic Drugs. A. Carpmael, London. From Schering-Kahlbaum Akt.-Ges., 170, Mullerstrasse, Berlin. Application date, March 19, 1929.

To obtain acyl derivatives of *k*-strophanthidin, either form of *k*-strophanthidin is treated with the halide or anhydride of an aliphatic, halogenated aliphatic, or aromatic-aliphatic acid at a low temperature in the presence of chloroform and pyridine. Examples are given.

323,985. Fertilisers. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 8, 1929.

Phosphoric acid is heated with potassium and/or ammonium chloride until a substantial amount of hydrochloric acid is expelled, and ammonium nitrate or potassium nitrate with urea, added. The initial heating may be in a vacuum or in a current of water vapour, and if potassium pyro-phosphate or meta-phosphate is formed, it is converted into ortho-phosphate by heating with acid, or with water in an autoclave. The mixture is finally treated with ammonia.

324,002. Dyes. R. Tonkin, J. S. Wilson, J. Thomas, and Scottish Dyes, Ltd., Earl's Road, Grangemouth, Scotland. Application date, July 9, 1928.

Watery pastes of anthraquinone vat dyestuffs are dried below 50° C. with or without reduced pressure and with or without dextrine or other dispersing agents, or the products may be ground with soap after drying. The products are fine powders. Examples are given of the treatment of Caledon brown R standard paste, Caledon blue R standard paste, and Caledon red BN standard paste.

324,004. Synthetic Rubber. J. Y. Johnson, London, and A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, August 14, 1928.

Diolefines are polymerised with the addition of a diluent non-reactive hydrocarbon which may have a boiling point similar to the diolefine, or below or above it up to 250° C., but the boiling point is sufficiently low to enable the diluent to be removed by distillation at moderate temperature with or without vacuum, after polymerisation. The polymerisation is effected by means of sodium, or heat, or the diolefine may be emulsified with an aqueous liquid and polymerised in the presence of proteins by means of enzymes, or oxidising agents such as hydrogen peroxide.

324,016. Boron Trifluoride. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 12, 1928.

Boron trifluoride is obtained by treating a fluoride with boric acid or a borate in sulphuric acid, in the presence of sulphur trioxide or an excess of sulphuric acid as dehydrogenating agents.

324,017-8. Dyes and Intermediates. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application dates, October 12 and 13, 1928.

324,017. Di-naphthylene dioxide is halogenated in a high boiling organic solvent. Thus, di-naphthylene dioxide is dissolved in trichlor-benzene and chlorinated to obtain ditetra- and deca-chlor-dinaphthylene dioxide, or brominated to obtain the di- and tetra-bromo derivatives. The products are pigment dyestuffs. In an example, a paste of tetra-chlor-di-naphthylene dioxide is mixed with a suspension of aluminium hydroxide, filtered, dried, and ground, with printers' varnish to obtain a printing colour. Dibrom-dinaphthylene dioxide may be ground with heavy spar, and the product ground with linseed oil to obtain an oil colour.

324,018. An isatoic acid anhydride or derivative is treated with fuming sulphuric acid and the sulphonated product is hydrolysed to obtain the sulpho-*o*-amino-carboxylic acid. In an example, isatoic acid anhydride is sulphonated with oleum and the product treated with sodium carbonate to obtain 5-sulpho-2-amino-benzoic acid. Examples are given of the similar treatment of 4-methyl-isatoic acid anhydride (from phosgene and 4-methyl-2-amino-benzoic acid) to obtain 5-sulpho-4-methyl-2-amino-benzoic acid, naphthisatoic acid anhydride from phosgene and 2-amino-3-naphthoic acid) to obtain the sulphonated naphthylamine-carboxylic acid, and bis-isatoic acid anhydride (from phosgene and benzidine-*o*-o^1-dicarboxylic acid) to obtain the corresponding sulpho-benzidine-carboxylic acid.

324,028. SHAPED METALLIC OXIDES. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 10, 1928.

Filter plates, diaphragm plates, electrodes, etc., of metallic oxides are obtained by oxidising porous masses obtained by sintering metallic powders, especially those obtained by decomposition of metallic carbonyls. The article may be reinforced by a more difficultly oxidisable metal. The oxidation may be partial or complete, and may be effected by air, carbon dioxide or steam, first at low temperatures and then at high temperatures. In an example, a highly porous iron plate is heated to 400° C. in a stream of carbon dioxide, and then at 600° C. until oxidation is complete, to obtain a porous plate of ferroso-ferric oxide.

324,031. WETTING AGENTS. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 8, 1928.

These agents are obtained from a mixture of unsaturated acids obtained by splitting water from the oxidation products of paraffin hydrocarbons, waxes, etc., by treating with organic or inorganic agents having a basic action and giving water soluble salts with the above acids, such as ammonia, pyridine, amines, or quaternary ammonium bases, dilute caustic soda or sodium carbonate. Alternatively, the initial material after esterification may be treated with a sulphonating or chlorinating agent, and the product neutralised with a basic agent. In an example, a mixture of unsaturated acids is esterified with glycerol and sulphonated with sulphuric acid to obtain a product similar to Turkey Red oil, which may be treated with ammonia, pyridine, caustic soda, etc.

324,041. DYE INTERMEDIATES AND INSECTICIDES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 15, 1928.

Four methods for producing diazo amino compounds are described. (1) A diazo compound is treated with a primary amine of the benzene series containing a sulphonic and a carboxylic group, or two or more carboxylic groups; (2) a diazo compound containing at least one negative substituent is coupled with a water soluble poly-nuclear primary amine which does not form azo dyestuffs; (3) a diazo compound is treated with an aromatic mono- or poly-nuclear primary amine containing one or more sulphamino groups; (4) a negatively substituted diazo compound is treated with a primary amine of the benzene series containing two or more sulphonic acid groups. The products can be reconverted into the diazo compounds by treating with acids, and are used in dyeing and printing and as insecticides. A large number of diazo-amino compounds are described from reagents of which the following are typical:—diazotised-*m*-chloraniline and 2- amino-4-sulpho-benzoic acid, diazotised 4-chlor-2-toluidine and 3-amino-5-sulpho-benzoic acid, diazotised *o*-chloraniline and 1-amino-benzene-3 : 5-dicarboxylic acid, diazotised 4-chlor-2-anisidine and 2-amino-4-sulpho-benzoic acid, diazotised 2-amino-carbazole and 4-sulpho-2-amino-benzoic acid.

324,084. DYES. British Alizarine Co., Ltd., and P. P. Beghin, Trafford Park, Manchester. Application date, August 18, 1928.

1-nitro-anthraquinone-2-carboxylic acid or a derivative is condensed with an arylamine having a free *o*-position to the amino group, in the presence of weakly acid catalysts such as boric acid, arsenious acid, oxalic acid or phthalic acid, and an inert solvent such as nitrobenzene or an excess of the arylamine. Some examples are given.

324,090. DYE INTERMEDIATES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 15, 1928.

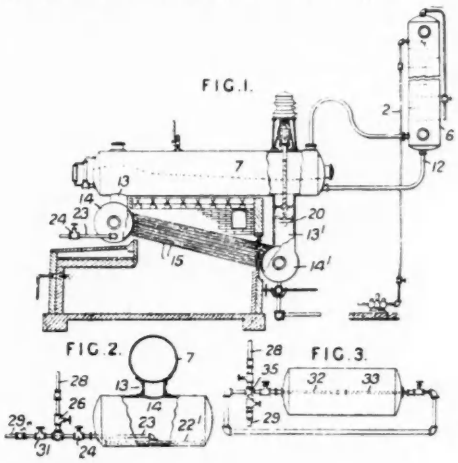
Sulphonic acids of nitrohalogen-diaryl-ketones and sulphones and substitution products containing labile halogen atoms are obtained by sulphonating compounds of this type. The products are converted into dye intermediates. In an example, 3-nitro-4-chloro-benzophenone is sulphonated with oleum, the sulphonic acid is condensed with aniline, and the resulting 3-nitro-4-phenylamino-benzophenone-3¹-sulphonic acid is reduced to the amino compound. The aniline may be replaced by 4-methoxy-1-aminobenzene, dimethylamine, ethylene-diamine, etc. Other benzophenones may also be used as starting materials. The preparation of *o*-chlornitro-diphenylsulphone-3¹-sulphonic acid is described, and the chlorine atom may be replaced by a hydroxy group by treatment with caustic soda, and the nitro group reduced to form 3-amino-4-hydroxy-1 : 1¹-diphenylsulphone-3¹-sulphonic acid. A number of other examples are also given.

324,104. INDIARUBBER GELS. Dunlop Rubber Co., Ltd., 32, Osnaburgh Street, London, D. F. Twiss, F. T. Purkis, and E. A. Murphy, Fort Dunlop, Erdington, Birmingham. Application date, October 18, 1928.

Concentrated aqueous dispersions are treated with one or more non-coagulants which decompose to form coagulants on heating, such as ammonium persulphate with or without trioxymethylene, aldehydes, or other neutral organic substances capable of being oxidised to acid substances, ammonium thiosulphate, or other ammonium salts of sulphur acids such as dithionates. The amount added may be about 0·1 per cent. and the mixture is heated to 90°C. to produce a gel.

324,112. CRACKING OILS. C. A. Jensen, London. From Jenkins Petroleum Process Co., 844, Rush Street, Chicago. Application date, October 18, 1928.

A still 7 is connected to a set of cracking tubes 15 by conduits 13, 13¹ and drums 14, 14¹, the oil being circulated by a



324,112

propeller 20. Vapour passes to a dephlegmator 6, and heavier fractions are condensed by crude oil supplied through a pipe 2. Condensate and crude oil return through pipe 12 to the still. At short intervals, 45-65 per cent. of the residual oil is drawn off from the drum 14 through perforated nipples 22¹ and pipes 23, 28, and between the intervals fresh oil is supplied through pipe 29. Alternatively, two sets of nipples 32, 33, may be used alternately for charging and discharging. The supply of fresh oil to that part of the circuit from which the residual oil is drawn off prevents clogging by carbon deposits.

324,119. DYES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date October 19, 1928.

Indigoid dyestuffs containing a replaceable hydrogen atom attached to at least one nitrogen atom are condensed with a mono-sulphohalide of benzoic acid in the presence of an organic base. The products are carboxylic amides containing free sulphonic groups and may be used for dyeing or printing, since they are converted into the parent dyestuffs on the fibre by the action of alkaline saponifying agents. Examples are given of the treatment of indigo and other dyestuffs with benzoic acid *m*-sulphochloride in pyridine.

324,120. COLOUR LAKES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 19, 1928.

Quinizarine disulphonic acids and anthraquinone-1-hydroxy-4-amino-disulphonic acids are converted into the aluminium compounds to obtain lakes. In an example, quinizarine-2 : 5- and 2 : 6-disulphonic acids are obtained from quinizarine-5- and 6-sulphonic acids by sulphonation with sodium sulphite in presence of pyrolusite and boric acid, and the potassium salts are treated with aluminium sulphate. Another example describes the preparation and treatment of potassium anthraquinone-1-hydroxy-4-amino-2 : 8-disulphonate.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 294,963 (I.G. Farbenindustrie Akt.-Ges.), relating to artificial rubber, see Vol. XIX, p. 323; 297,003 (Soc. of Chemical Industry in Basle), relating to dyestuffs containing metal, see Vol. XIX, p. 497; 298, 617 (I.G. Farbenindustrie Akt.-Ges.), relating to denaturing agents for alcohol, see Vol. XIX, p. 565; 300,208 (I.G. Farbenindustrie Akt.-Ges.), relating to vulcanization of rubber, see Vol. XX, p. 53; 300,504 (I.G. Farbenindustrie Akt.-Ges.) relating to azo dyestuffs, see Vol. XX, p. 53; 300,965 (J. A. Pond), relating to soluble phosphatic fertilisers from tricalcium phosphates, see Vol. XX, p. 82; 301,096 (Soc. of Chemical Industry in Basle), relating to azo dyestuffs, see Vol. XX, p. 105; 303,123 (I.G. Farbenindustrie Akt.-Ges.), relating to vat dyestuffs, see Vol. XX, p. 214; 304,280 (I.G. Farbenindustrie Akt.-Ges.), relating to basic nitro-derivatives of 9-aminoacridine, see Vol. XX, p. 283; 306,103 (Stockholms Superfosfat Fabriks Aktiebolag), relating to fertilisers, see Vol. XX, p. 412; 306,448 (J. R. Geigy Soc. Anon.), relating to mordant dyeing disazo dyestuffs, see Vol. XX, p. 432; 312,902 (Federal Phosphorus Co.), relating to diphenyl, see Vol. XXI, p. 114; 314,035 (Selden Co.) relating to mono-carboxylic acids and derivatives, see Vol. XXI, p. 179; 314,956 (J. Schroter), relating to ferricyanides, see Vol. XXI, p. 224; 314,972 (C. J. Hansen), relating to conversion of ammonium thiocyanate into ammonium sulphate and sulphur, see Vol. XXI, p. 224.

Specifications Accepted with Date of Application

301,036. Esters of cellulose or other carbohydrates, Manufacture of. I.G. Farbendindustrie Akt.-Ges. November 23, 1927.

301,329. Dyestuffs, Manufacture of. Durand and Huguenin Akt.-Ges. November 26, 1927.

301,420. Refining low-temperature tar, tar oils of any origin, crude benzene, and products obtained by the destructive hydrogenation of carbonaceous materials. F. Hofmann and C. Wulff. November 29, 1927.

301,423. Monoazo dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 29, 1927.

301,515. Latex-like emulsions and rubber-like masses, Manufacture of. I.G. Farbenindustrie Akt.-Ges. December 2, 1927.

301,755. Acetyl cellulose, Manufacture of. I.G. Farbenindustrie Akt.-Ges. December 2, 1927.

302,601. Azo-dyestuffs insoluble in water, Manufacture of. I.G. Farbenindustrie Akt.-Ges. December 17, 1927.

305,648. *o*-Oxynitroso dyes and their heavy metal compounds, Preparation of J. R. Geigy Soc. Anon. February 9, 1928.

306,972. Condensation products of arylamines, Manufacture of. P. Haller and H. Kappeler. February 29, 1928. Addition to 266,358 and 274,501.

310,956. Carrying out catalytic reactions, Method and apparatus for. Selden Co. May 4, 1928.

311,372. Vulcanising rubber, Manufacture of agents for use in. I.G. Farbenindustrie Akt.-Ges. May 10, 1928.

312,630. Rubber and the like, Preservation of. B. F. Goodrich Co. May 29, 1928.

313,446. Ammonia salts, Manufacture of. Montecatini Soc. Generale per l'Industrie Mineraria ed Agricola. June 11, 1928. Addition to 292,129.

325,797. Anthanthrone derivatives, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) August 25, 1928.

325,817. Unsaturated hydrocarbons from gaseous mixtures, Separation of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 26, 1928.

325,822. Cellulose esters, Manufacture of. H. Dreyfus. November 21, 1928.

325,824. Liquids and organic substances, Treatment of—by irradiation. V. C. From, C. D. Rowley, and A. W. Larsky. November 23, 1928.

325,846. Organic mercury compounds, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 30, 1928.

325,847. Aqueous solutions of barbituric acids, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 30, 1928.

325,855. Propylation of ortho- and paracresol. Rheinische Kampfer-Fabrik Ges. October 12, 1927.

325,856. Thymol, Preparation of. Rheinische Kampfer-Fabrik Ges. October 12, 1927.

325,869. Coal, Carbonisation of. H. F. Maurel. November 1, 1928.

325,933. Triarylcarbinols, Manufacture of. Imperial Chemical Industries, Ltd., and S. Coffey. January 1, 1929.

325,941. Highly concentrated paraffin wax, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) January 7, 1929.

325,968. Hydrogen from gaseous mixtures, Separation of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) January 30, 1929.

325,985. Esters of 2-phenylquinoline-4-carboxylic acid, and its homologues, Manufacture of. A. J. Stephens. (*R. von Wulfing and E. Moller (trading as J. A. Wulfing.*) February 8, 1929.

326,022. Sulphonic acids of 1-w-amino-methylnaphthalene, Manufacture of. O. Y. Imray. (*I.G. Farbenindustrie Akt.-Ges.*) March 12, 1929.

326,116. Borax, Extraction of. T. M. Cramer. December 19, 1928.

326,117. Alkaline earth cyanamides, Manufacture of. J. Guillissen and Union Chimique Belge Soc. Anon. July 5, 1929.

Applications for Patents

[*In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.*]

Arnold, C., and Dow Chemical Co. Production of magnesium alloys. 7,862. March 11.

Calvert, H. R., Imperial Chemical Industries, Ltd., and McAulay, J. Removal of carbon disulphide from gases. 7,703. March 10.

Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of 7-hydroxy-*a*-naphtho-carbazoles. 7,774. March 10.

—— Preserving natural varieties of rubber, etc. 8,335. March 14.

—— Manufacture of thiuram mono sulphides. 8,336. March 14.

—— Manufacture of vat dyestuffs. 8,446. March 15.

Dryice Corporation of America. Solid carbon dioxide products. 7,860. March 11. (United States, March 28, 1929).

Eastman Kodak Co., and Kodak, Ltd. Process of making cellulose acetate. 7,916. March 11.

Girsewald, Conway, Baron von, Metallges. Akt.-Ges., and Stahl, E. Production of sulphates. 8,168. March 13.

Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Obturating picture-taking objectives having multicolour filter. 7,915. March 11.

—— Manufacture of substituted phenol carboxylic acid. 8,048, 8,049, 8,062. March 12.

—— Manufacture of derivatives of metahydroxydiphenylamine. 8,050. March 12.

Harris, J. E. G., Morton, J., and Morton Sundour Fabrics, Ltd. Dyeing animal fibres, etc. 7,815. March 10.

I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of metal carbonyls. 7,778. March 10.

—— Manufacture of artificial threads. 8,061. March 12. (October 4, 1928).

—— Manufacture of calcium cyanamide free from dust. 8,180. March 13.

I.G. Farbenindustrie Akt.-Ges. Separating aliphatic amines. 8,051. March 12. (Germany, March 12, 1929).

—— Packing for photographic plates. 8,311. March 14. (Germany, March 16, 1929).

—— Washing, etc., spinning cakes. 8,312. March 14. (Germany, March 16, 1929).

—— Production of quartz mirrors for astronomical purposes. 8,397. March 15. (Germany, April 22, 1929).

—— Manufacture of 3-ethoxy-4-oxy-benzaldehyde. 8,418. March 15.

Imperial Chemical Industries, Ltd. Manufacture of fertilisers. 8,024. March 12.

—— Refining crude oils, etc. 8,025. March 12.

Imperial Chemical Industries, Ltd., Wyler, M., and Lumsden, C. H. Manufacture of solid stable diazo compounds. 8,026. March 12.

Imperial Chemical Industries, Ltd., Thomas, J., and Shaw, C. Production of dyestuffs, etc. 8,292. March 14.

—— Production of phthalic anhydride derivatives, etc. 8,293. March 14.

Knoll Akt.-Ges. Chemische Fabriken. Production of tetrazols. 8,319. March 14. (Germany, March 14, 1929).

Lefranc, J. Preparation of butyric cellulose esters. 7,870. March 11.

Levy, S. I. Treating recovered sulphur. 8,441. March 15.

—— Recovering arsenic and chlorine from sulphur. 8,442. March 15.

Scottish Dyes, Ltd., Thomas, J., and Shaw, C. Production of dyestuffs. 8,165. March 13.

Soc. d'Etudes et d'Exploitation des Matières Organiques, and Thornton, A. A. Preparation of metals for catalysts. 7,737. March 10.

—— Reducing phenols and cresols to benzene and toluene. 7,901. March 11.

Soc. of Chemical Industry in Basle. Apparatus for obtaining light metals by electrolysis. 8,161. March 13. (Switzerland, August 29, 1929).

—— Manufacture of dyestuffs. 8,309. March 14. (Switzerland, March 16, 1929.)

—— Process for dyeing silk. 8,416. March 15. (Switzerland, March 16, 1929).

—— Manufacture of metalliferous dyestuffs. 8,417. March 15. (Switzerland, March 16, 1929).

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID, CHROMIC.—1s. 0⅝d. per lb. d/d U.K.

ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° Tw.—Spot £20 to £25 per ton, makers' works according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.

AMMONIUM BICHROMATE.—8½d. per lb. d/d U.K.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER, 35%.—Spot, £7 10s. per ton d/d station in casks, special terms for contracts.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards.

CALCIUM CHLORIDE (SOLID).—Spot, £4 15s. to £5 5s. per ton d/d in drums.

CHROMIUM OXIDE.—9½d. and 10½d. per lb. according to quantity d/d U.K.

CHROMOTAN.—Crystals, 3⅝d. per lb. Liquor, £8 15s. per ton d/d U.K.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4⅝d. per lb. nett d/d U.K. spot; ground ½d. per lb. extra.

POTASSIUM CHLORATE.—3⅞d. per lb., ex-wharf, London, in cwt. kegs.

POTASSIUM CHROMATE.—8¼d. per lb. d/d U.K.

SALAMMONIAC.—Firsts lump, spot, £42 10s. per ton d/d station in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE, UNGROUND.—Spot, £3 7s. 6d. per ton d/d station in bulk.

SODA ASH, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

SODA CAUSTIC, SOLID, 76/77%.—Spot, £14 10s. per ton, d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2 cwt. bags.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.

SODIUM BICHROMATE CRYSTALS.—3⅝d. per lb. nett d/d U.K. spot. Anhydrous ¾d. per lb. extra.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.r. London.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.

SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.

SODIUM SULPHIDE CONC. SOLID.—Spot, £10 5s. per ton d/d in drums. Crystals—Spot, £7 10s. per ton d/d in sellers' casks.

SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—7d. to 7½d. per lb. Crude 60's, 2s. 4½d. to 2s. 5d. Jan.-June, 2s. 4d. July-Dec. per gall.

ACID CRESYLIC 99/100.—2s. 2d. to 2s. 6d. per gall. Pure, 5s. 6d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 2s. 3d. Dark, 1s. 6d. to 1s. 10d. Refined, 2s. 7d. to 2s. 10d. per gall.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—4¼d. to 5¼d. per gall. 1100, 5¼d. to 6d. per gall.; 1110, 6d. to 6½d. per gall. Unstrained (Prices only nominal).

BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall.; Pure, 1s. 10d. to 1s. 11d. per gall.

TOLUOLE.—90%, 1s. 9d. to 2s. 1d. per gall. Firm. Pure, 1s. 11d. to 2s. 5d. per gall.

XYLOL.—1s. 5d. to 1s. 10d. per gall. Pure, 1s. 8d. to 2s. 1d. per gall.

CREOSOTE.—Cresylic, 20/24%, 6¾d. to 7d. per gall.; Heavy, for Export, 6¼d. to 6⅝d. per gall. Home, 4d. per gall. d/d. Middle oil, 4½d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 1¼d. to 1⅝d. per gall. ex works. Salty, 7½d. per gall.

NAPHTHA.—Crude, 8½d. to 8¾d. per gall. Solvent, 90/160, 1s. 3d. to 1s. 3½d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 6d. per gall. Solvent 90/190, 1s. to 1s. 2½d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £12 5s. per ton. Purified Crystals, £14 10s. per ton. Flaked, £14 to £15 per ton, according to districts.

PITCH.—Medium soft, 46s. to 47s. 6d. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 3s. 9d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy prices only nominal.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 8½d. per lb.

ACID GAMMA.—3s. 9d. per lb. 100% d/d buyer's works.

ACID H.—2s. 3d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 6d. per lb. 100% d/d buyer's works.

ACID NEVILLE AND WINTHER.—2s. 7d. per lb. 100% d/d buyer's works.

ACID SULPHANILIC.—8½d. per lb. 100% d/d buyer's works.

ANILINE OIL.—8½d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—8½d. per lb. d/d buyer's works.

BENZALDEHYDE.—1s. 8d. per lb., packages extra, d/d buyer's works.

BENZIDINE BASE.—2s. 4d. per lb. 100% d/d buyer's works.

BENZOIC ACID.—1s. 8½d. per lb. d/d buyer's works.

o-CRESOL 29/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.

m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots d/d.

p-CRESOL 32/34° C.—2s. per lb., in ton lots d/d.

DICHLORANILINE.—1s. 10d. per lb.

DIMETHYLANILINE.—1s. 9½d. per lb., drums extra d/d buyer's works.

DINITROBENZENE.—8d. per lb.

DINITROCHLORBENZENE.—£74 per ton d/d.

DINITROTOLUENE.—48/50° C., 7½d. per lb.; 66/68° C., 9d. per lb.

DIPHENYLAMINE.—1s. 8d. per lb. d/d buyer's works.

a-NAPHTHOL.—1s. 11d. per lb. d/d buyer's works.

B-NAPHTHOL.—£65 per ton in 1 ton lots, d/d buyer's works.

a-NAPHTHYLAMINE.—1s. per lb. d/d buyer's works.

B-NAPHTHYLAMINE.—2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 11d. per lb.

m-NITRANILINE.—2s. 6d. per lb. d/d buyer's works.

p-NITRANILINE.—1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—6½d. per lb, 5-cwt. lots, drums extra, d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.

R. SALT.—2s. per lb. 100% d/d buyer's works.

SODIUM NAPHTHIONATE.—1s. 6½d. per lb. 100% d/d buyer's works.

o-TOLUIDINE.—8d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—1s. 9d. per lb. d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 1d. per lb. 100%.

N. W. ACID.—4s. 9d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£78 per ton.

CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.

WOOD CREOSOTE.—1s. 9d. per gall., unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d per gall. Solvent, 4s. to 4s. 3d. per gall.

WOOD TAR.—£3 10s. to £4 10s. per ton

BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 8d. to 1s. 10d. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.

CADMIUM SULPHIDE.—5s. to 6s. per lb.

CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity.

CARBON BLACK.—4 1/16 d. to 4½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 6d. per lb.

LITHOPONE, 30%.—£20 to £22 per ton.

SULPHUR.—£9 10s. to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£55 to £60 per ton.

ZINC SULPHIDE.—8d. to 11d. per lb

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£37 per ton, ex wharf London, barrels free.

ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 11d. per lb., according to quantity.

ACID, BENZOIC B.P.—2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £32 per ton; powder, £36 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—1s. 8½d. to 1s. 9½d. per lb., less 5%.

ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 7d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—1s. 3½d. per lb., less 5%.

ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.

AMIDOL.—7s. 6d. to 9s. per lb., d/d.

AMIDOPYRIN.—7s. 9d. to 8s. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—9s. per oz.

BARBITONE.—5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—3s. to 3s. 3d. per lb .spot.

BISMUTH CARBONATE.—8s. 9d. per lb.

BISMUTH CITRATE.—8s. 3d. per lb.

BISMUTH SALICYLATE.—8s 3d. per lb.

BISMUTH SUBNITRATE.—7s. 6d. per lb.

BISMUTH NITRATE.—Cryst. 5s. 3d. per lb.

BISMUTH OXIDE.—11s. 3d. per lb.

BISMUTH SUBCHLORIDE.—10s. 3d. per lb.

BISMUTH SUBGALLATE.—7s. 3d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.

BORAX B.P.—Crystal, £21 per ton; powder, £22 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 2s. 0d. per lb.; potassium, 1s. 8d. per lb.; granular, 1s. 5½d. to 1s. 7¾d. per lb.; sodium, 1s. 11d. per lb. Prices for 1 cwt. lots.

CALCIUM LACTATE.—B.P., 1s. 3d. to 1s. 5d. per lb., in 1-cwt. lots.

CAMPHOR.—Refined flowers, 3s. 3d. to 3s. 4d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.

CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.

CREOSOTE CARBONATE.—6s. per lb.

ETHERS.—S.G. ·730—11d. to 1s. per lb., according to quantity; other gravities at proportionate prices.

FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.

GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.

HEXAMINE.—2s. 3d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchesters, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.

HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8½d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.

IRON AMMONIUM CITRATE.—B.P., 2s. 8d. to 2s. 9d. per lb. Green, 2s. 10d. to 3s. per lb. U.S.P., 2s. 7d. to 2s. 10d. per lb.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8¾d. to 9½d. per oz., according to quantity.

MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 16s. 3d. per lb. net; Synthetic, 9s. 6d. to 11s. 9d. per lb.; Synthetic detached crystals, 9s. 6d. to 11s. per lb., according to quantity; Liquid (95%), 9s. per lb.

MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.

METHYL SULPHONAL.—18s. 6d. to 20s. per lb.

METOL.—9s. to 11s. 6d. per lb. British make.

PARAFORMALDEHYDE.—1s 9d. per lb. for 100% powder.

PARALDEHYDE.—1s. 4d. per lb.

PHENACETIN.—3s. 8½d. to 4s. 1d. per lb.

PHENAZONE.—5s. 11d. to 6s. 1½d. per lb.

PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—103s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P.C., 2s. 6d. per lb. in 28 lb. lots. Smaller quantities 1d. per lb. more.

POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins

RESORCIN.—2s. 10d. to 3s. per lb., spot.

SACCHARIN.—43s. 6d. per lb.

SALOL.—2s. 3d. to 2s. 6d. per lb.

SODIUM BENZOATE B.P.—1s. 9d. per lb. for 1-cwt. lots.

SODIUM CITRATE, B.P.C., 1911, AND U.S.P. VIII.—2s. 2d. per lb., B.P.C. 1923, and U.S.P. IX—2s. 6d. per lb. Prices for 28 lb. lots. Smaller quantities 1d. per lb. more.

SODIUM FERROCYANIDE.—4d. per lb., carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—100s. per cwt. Crystals, 5s. per cwt. extra.

SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 1d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.

SODIUM SULPHIDE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.

SULPHONAL.—9s. 6d. to 10s. per lb.

TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 1s. 10d. per lb.

THYMOL.—Puriss, 7s. 6d. to 8s. 6d. per lb., according to quantity. Firmer. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—12s. per lb.

AMYL ACETATE.—2s. 6d. per lb.

AMYL BUTYRATE.—5s. per lb.

AMYL CINNAMIC ALDEHYDE.—12s. per lb.

AMYL SALICYLATE.—3s. per lb.

ANETHOL (M.P. 21/22° C.).—6s. 6d. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—2s. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—2s. per lb.

BENZYL BENZOATE.—2s. 3d. per lb.

CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.

COUMARIN.—8s. 3d. per lb.

CITRONELLOL.—9s. 6d. per lb.

CITRAL.—8s. per lb.

ETHYL CINNAMATE.—6s. 6d. per lb.

ETHYL PHTHALATE.—2s. 9d. per lb.

EUGENOL.—9s. per lb.

GERANIOL (PALMAROSA).—19s. per lb.

GERANIOL.—7s. 6d. to 10s. per lb.

HELIOTROPINE.—6s. 6d. per lb.

ISO EUGENOL.—11s. 9d. per lb.

LINALOL.—Ex Bois de Rose, 14s. per lb. Ex Shui Oil, 11s. 6d. per lb.

PHENYL ETHYL ACETATE.—11s. per lb.

PHENYL ETHYL ALCOHOL.—9s. 6d. per lb.

RHODINOL.—46s. per lb.

SAFROL.—2s. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—13s. 6d. to 15s. per lb. Ex Guaiacol, 12s. 6d. to 14s. per lb.

Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. per lb.

ANISE OIL.—4s. 3d. per lb.

BERGAMOT OIL.—11s. 3d per lb.

BOURBON GERANIUM OIL.—18s. per lb.

CAMPHOR OIL, WHITE.—160s. per lb.

CASSIA OIL, 80/85%.—4s. 9d. per lb.

CINNAMON OIL LEAF.—7s. 9d. per oz.

CITRONELLA OIL.—Java, 2s. 8d. per lb., c.i.f. U.K. port; pure, Ceylon, 2s. 6d. per lb.

CLOVE OIL (90/92%).—6s. 6d. per lb.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 9d. per lb.

LAVENDER OIL.—Mont Blanc, 38/40%, 11s. 6d. per lb.

LEMON OIL.—5s. 9d. per lb.

LEMONGRASS OIL.—4s. per lb.

ORANGE, SWEET.—11s. 3d. per lb.

PEPPERMINT.—12s. 6d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, March 20, 1930.

BUSINESS has continued along quiet, steady lines, the volume booked being equal to previous weeks. Prices, with one or two exceptions, continue unchanged and firm. There has been a steady export business.

General Chemicals

ACETONE.—Market unchanged at £71 10s. to £80 per ton, with a satisfactory demand.

ACID ACETIC.—Regular business passing at £36 10s. for 80% technical and £37 10s. for 80% edible.

ACID CITRIC.—Rather lower prices have been quoted for this product and the market is rather unsteady at about 1s. 10d. per lb., less 5%.

ACID LACTIC.—Unchanged and in fair demand at £43 per ton for 50% by weight, pale grade.

ACID OXALIC.—Brisk demand has been received, and prices are very firm at £30 7s. 6d. to £32 per ton, according to quantity.

ALUMINA SULPHATE.—In good request at £8 to £8 15s. per ton for 17/18% iron-free quality, at which figure the market is firm.

ARSENIC.—Only in small demand, and price remains easy at £16 5s. to £16 10s. per ton, free on rail at mines.

BORAX.—More business going through and the market is very firm.

CREAM OF TARTAR.—A steady demand is being received, with the market unchanged at 102s. per cwt.

COPPER SULPHATE.—Inquiries are coming to hand more freely and prices are steady.

FORMALDEHYDE.—Steady demand, with prices unchanged at about £35 per ton.

LEAD ACETATE.—A fair business has been placed at the recently reduced prices of £42 per ton for white, and brown at £41 per ton, and the market is now steady.

LEAD NITRATE.—Unchanged at about £33 per ton.

LIME ACETATE.—Only a small demand, with prices a shade easier.

LITHOPONE.—In fair request at £19 15s. to £23 per ton, according to grade.

POTASSIUM CARBONATE.—Fair demand at £27 per ton for 96/98% arsenic-free quality.

POTASSIUM PERMANGANATE.—The market is unchanged at 5½d. per lb. for B.P. needle crystals, with a regular demand.

SODIUM ACETATE.—Crystal quality in better request at about £21 10s. to £22 per ton.

SODIUM BICHROMATE.—Unchanged at 3⅝d. per lb. and in fair demand.

SODIUM HYPOSULPHITE.—Commercial crystals, £8 10s. to £9 per ton, with photographic crystals at £14 15s., with an improving demand.

SODIUM NITRITE.—In moderate request at about £20 per ton.

SODIUM PRUSSIATE.—Unchanged at 4¾d. to 5¼d. per lb.

SODIUM SULPHIDE is in fair request at unchanged prices.

TARTAR EMETIC.—Steady at about 11d. per lb.

ZINC SULPHATE.—In a little better request at about £13 per ton.

Coal Tar Products

There is no new feature in the coal tar product market, and prices are unchanged.

MOTOR BENZOL.—Remains at about 1s. 5½d. to 1s. 6d. per gallon, f.o.r.

SOLVENT NAPHTHA.—Quoted at about 1s. 2½d. to 1s. 3d. per gallon, f.o.r.

HEAVY NAPHTHA.—Unchanged, at about 1s. 1d. per gallon, f.o.r.

CREOSOTE OIL.—Quoted at 3d. to 3¼d. per gallon, f.o.r. in the North, and at 4d. to 4¼d. per gallon in London.

CRESYLIC ACID.—Unchanged, at 2s. per gallon for the 98/100% quality, and at 1s. 10d. per gallon, ex works, for the dark quality 95/97%.

NAPHTHALENES.—Firelighter quality is quoted at £3 10s. to £3 15s. per ton, the 74/76 quality at £4 to £4 5s. per ton, and the 76/78 quality at about £5 per ton.

PITCH.—Remains at a nominal figure of 45s. to 47s. 6d. per ton, f.o.b. East Coast port.

The following additional prices have been supplied to us :—

CARBOLIC ACID.—No change to report during the past week. Prices remain steady at 7d. to 7½d. per lb.

ACETYL SALICYLIC ACID.—2s. 9d. to 2s. 11d. per lb.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.

PHENACETIN.—There is no change to report, prices being from 3s. 9d. to 4s. 1d. per lb.

PHENOLPHTHALEIN.—The schedule prices previously in force are maintained, namely 5s. 11d. to 6s. 1½d. per lb.

VANILLIN 100% from clove oil is quoted to-day at 14s. in cwt. lots. Smaller quantities 14s. 3d. to 14s. 6d. per lb.

Latest Oil Prices

LONDON, March 19.—LINSEED OIL, closed firm. Spot, ex mill, was 10s. per ton lower at £37 10s., but other positions were 12s. 6d. to 15s. per ton higher. March, £34 17s. 6d.; April, £34 17s. 6d.; May-August and September-December, £35, naked. RAPE OIL was quiet. Crude extracted, £36; technical refined, £37 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £28; refined common edible, £32 10s.; and deodorised, £34 10s., naked, ex mill. TURPENTINE was quiet. American, spot, 43s. 3d.; April-June, 43s. 6d. per cwt.

HULL.—LINSEED OIL.—Spot to April, £35; May-August, £35 10s. COTTON OIL.—Egyptian crude, spot, £28 5s.; edible refined, spot, £31 5s.; technical, spot, £30 15s.; deodorised, spot, £33 5s. PALM KERNEL OIL.—Crude naked, 5½ per cent., spot, £30 10s. GROUNDNUT OIL.—Crushed extracted, spot, £33; deodorised, spot, £37. SOYA OIL.—Extracted and crushed, spot, £30 10s.; deodorised, spot, £34. RAPE OIL.—Crushed extracted, spot, £35; refined, spot, £37 per ton. TURPENTINE.—Spot, 45s. 9d. per cwt., net cash terms, ex mill.

South Wales By-Products

THERE is slightly more activity in South Wales by-products, but pitch continues to be quiet, and there are no indications that patent fuel manufacturers will be buying on any scale for some time to come. Values are unchanged at from 45s. to 47s. per ton, delivered. Creosote is slightly better, with prices ranging from 2¼d. to 3¼d. per gallon. Road tar maintains its better call at from 10s. to 12s. per 40-gallon barrel. Motor benzol is in fair request at from 1s. 4d. to 1s. 6d. per gallon. Refined tars continue to have a good demand, with prices unchanged for coke oven and gasworks tar. Naphthas are slightly better. Solvent is in fair request at from 1s. 3d. to 1s. 5d. per gallon, while heavy has a small, but steady, call at from 11d. to 1s. 1d. per gallon. Sulphate of ammonia is in fair demand round about £10 2s. per ton, delivered. Patent fuel and coke exports are slightly better. Patent fuel prices for export are :—22s. 6d. per ton, ex-ship Cardiff, and from 20s. to 21s. per ton, ex-ship Newport and Swansea. Coke prices for furnace and foundry grades are unchanged at all South Wales ports.

Scottish Coal Tar Products

THERE is still a good demand for cresylic acid in this area, although prices are held in check by English production. Refined tars for roads are also in fair demand with prices steady.

Cresylic Acid continues to find a ready market for prompt delivery, but prices are unchanged as follows :—Pale, 99/100%, 1s. 11d. to 2s. per gallon; pale, 97/99%, 1s. 10d. to 1s. 11d. per gallon; dark, 97/99%, 1s. 8½d. to 1s. 9½d. per gallon; all ex works in buyers' packages. High boiling acid is more active than it has been for some time now and value is steady at about 1s. 9½d. to 1s. 11½d. per gallon.

Carbolic Sixties is on short production and price is nominal at 2s. 3d. to 2s. 5d. per gallon.

Creosote Oil.—Stocks are increasing with no immediate prospects of relief, except perhaps for qualities containing acids. Specification oil is easy at 3d. to 3½d. per gallon; gas works ordinary, 2⅞d. to 3⅜d. per gallon; washed oil, 3d. to 3½d. per gallon; all in bulk quantities f.o.r. works.

Coal Tar Pitch is extremely quiet and the season is closing with very little having been shipped from Glasgow. Nominal export value is 47s. 6d. per ton and home value is easy at 50s. to 52s. 6d. per ton.

Blast Furnace Pitch remains quiet at 30s. per ton f.o.r. works for home trade and 35s. per ton f.a.s. Glasgow for export.

Refined Coal Tar.—Some county business has been placed at current level of about 3⅞d. to 4⅜d. per gallon free on rails works in buyers' packages.

Blast Furnace Tar is unaltered at 2¼d. per gallon.

Crude Naphtha.—The better grades command about 4¾d. to 5¾d. per gallon according to district. Production is short at present.

Water White Products continue easy at 1s. 2d. to 1s. 3d. per gallon for 90/160 solvent and 1s. to 1s. 1d. per gallon for 90/190 heavy. Motor benzole is 1s. 6½d. to 1s. 6¾d. per gallon in bulk ex works.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, March 19, 1930.

THE past week has again shown little improvement in the Scottish Chemical Market, business on the whole being very quiet. The only inquiries of any importance which have been received are those for export business. There are no appreciable changes in prices.

Industrial Chemicals

ACETONE, B.G.S.—£71 10s. to £80 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID ACETIC.—This material is still scarce for immediate supply but prices remain unchanged as follows: 98/100% glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £32 per ton, packed in bags, carriage paid U.K. stations. There are a few fairly cheap offers made from the Continent.

ACID CARBOLIC, ICE CRYSTALS.—Quoted 8d. per lb. delivered.

ACID CITRIC, B.P. CRYSTALS.—Quoted 2s. per lb., less 5%, ex store, prompt delivery. Rather cheaper offers for early delivery from the Continent.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality 4s. per carboy. Dearsenicated quality, 5s. 6d. per carboy, ex works, full wagon loads

ACID NITRIC, 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—On offer at same price, viz.: 3½d. per lb,. ex store. Offered from the Continent at 3⅜d. per lb., ex wharf.

ACID SULPHURIC.—£2 15s. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 1s. 4d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. 4½d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £7 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton, c.i.f. U.K. ports. Crystal meal about 2s. 6d. per ton less.

AMMONIA, ANHYDROUS.—Quoted 7½d. per lb., carriage paid. Containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Rather easier and Spot material now obtainable at round about £34 per ton, ex wharf. On offer for prompt shipment from China at £30 per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—Quoted £18 per ton, ex wharf, prompt despatch from mines. Spot material still on offer at £19 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports. For Continental material price would be £10 per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. per ton to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £35 per ton, ex store. Continental mater al on offer at about £34 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 5s. per ton, ex wharf.

LEAD, RED.—Price now £37 10s. per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted round about £39 to £40 per ton, ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½%, delivered.

POTASSIUM BICHROMATE.—Quoted 4¾d. per lb. delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer at £26 10s. per ton, ex store. Offered from the Continent at £25 5s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100%.—Powder quoted £25 10s. per ton, ex wharf. Crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb., ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb., ex wharf.

SODA, CAUSTIC.—Powdered, 98/99%, £17 10s. per ton in drums, £18 15s. per ton in casks. Solid, 76/77%, £14 10s. per ton in drums, and £14 12s. 6d. per ton for 70/72% in drums, all carriage paid buyers' stations, minimum 4-ton lots, for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅝d. per lb., delivered buyers' premises with concession for contracts.

SODIUM CARBONATE. (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality 27s. 6d. per ton extra. Light soda ash £7 13s. per ton, ex quay, minimum 4-ton lots with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum 4-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum 4-ton lots. Prices for this year unchanged.

SODIUM NITRATE.—Chilean producers are now offering at £10 2s. per ton, carriage paid buyers' sidings, minimum 5-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices 55s. per ton, ex works, 57s. 6d. per ton delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption. Solid, 60/62%, £9 15s. per ton. Broken, 60/62%, £10 15s. per ton. Crystals, 30/32%, £7 17s. 6d. per ton, all delivered buyers' works on contract, minimum 4-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. od. per ton; ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE, 98%.—British material offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £10 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Oxide Purification

Address to Midland Junior Gas Association

THE subject of "Oxide Purification" was discussed by Mr. S. K. Hawthorn, of Nechells Gas Works, Birmingham, at a meeting of the Midland Junior Gas Association on Thursday, March 13. He stated that the use of Oxide "A" had a considerable share in the elimination of naphthalene troubles. Specially prepared oxide resulted in at least 30 per cent. increased capacity of dry purification plant.

Under present market conditions a content of 4 per cent. or over of prussian blue in spent oxide paid to extract. It was the considered opinion of those who had thoroughly investigated the matter that the cyanide content of spent oxide was more influenced by the treatment of the gas subsequent to carbonisation than by the actual type of carbonisation plant itself. It would, therefore, appear that careful attention to wet purification plant with a view to minimising cyanide absorption in that position and allowing the cyanide to be absorbed in the purifiers would not only be profitable, but might give better economic results than could be obtained by the installation of a cyanide extraction plant prior to the wet purification plant. In addition, the minimising of cyanide content of the ammoniacal liquor resulted in less harmful waste of ammoniacal liquors for subsequent sewage purification.

Manchester Chemical Market

(From Our Correspondent.)

Manchester, March 20, 1930.

There has been some inquiry and a moderate business put through in chemicals on this market during the past week, for the most part in respect of prompt or early delivery of relatively small parcels. Delivery specifications against contracts are reported to be on a not unsatisfactory scale having regard to the general industrial conditions in this part of the country. With regard to prices, the general tendency seems to be towards continued steadiness in the majority of sections, citric acid and lead derivatives being, perhaps, the outstanding exceptions.

Heavy Chemicals

No more than a moderate business has been going through in the case of hyposulphite of soda, which is quoted at about £9 10s. per ton for the commercial material and £15 for the photographic crystals. Bicarbonate of soda is moving off in fair quantities on the firm basis of £10 10s. per ton. Chlorate of soda meets with a certain amount of enquiry with offers ranging from £25 to £27 per ton, ex store, and according to quantity. A quietly steady trade is being put through in caustic soda, contract quotations for which are well held at from £12 15s. to £14 per ton, according to grade. Saltcake is in moderate request at about £2 15s. per ton. With regard to sulphide of sodium, there is a quiet demand at about from £9 10s. to £10 per ton for the 60/65 per cent. concentrated solid quality, and £8 for the commercial. Alkali keeps firm at round £6 per ton in contracts and a fair amount of business is being done. Bichromate of soda is steady on the basis of 3⅜d. per lb., and buying interest in this section during the week has been on a fair scale. Glauber salts are about unchanged at £2 15s. per ton, but only a quiet business is being put through. Dilbasis phosphate of soda is maintained at round £11 per ton.

Only a quiet trade is passing in the case of caustic potash, current values of which are in the neighbourhood of £31 per ton. Chlorate of potash continues to be quoted here at from £26 to £28 per ton, according to quantity, a moderate business being reported. A quietly steady demand has been experienced for yellow prussiate of potash and values maintain their firmness, offers ranging from 6¾d. to 7¼d. per lb. Permanganate of potash has attracted only comparatively small attention this week, but at round 5¼d. per lb. for the commercial quality, and 5⅜d. per lb. for the B.P., there has been no alteration in the price position. A fairly satisfactory business is reported in respect of bichromate of potash, prices of which are on the basis of 4⅜d. per lb., less 1 to 2½ per cent. Carbonate of potash meets with a quiet demand at round £26 5s. per ton.

There has been no appreciable improvement this week in the movement of sulphate of copper, but offers of this material keep up at about £26 5s. per ton, f.o.b. Arsenic meets with a moderate inquiry, and sales are being made at from £15 15s. to £16 per ton at the mines for white powdered, Cornish makes. The acetates of lime are reasonably steady, although not too active at about £7 10s. per ton for the brown quality, and £16 for the grey. The lead products are held at the lower rates quoted last week, and the demand is quiet; nitrate is on offer at round £32 per ton and acetate at £37 per ton for brown and £38 for white.

Acids and Tar Products

The weakening process in the citric acid section continues, and today's values are no better than about 1s. 9¾d. per lb. Tartaric acid, however, shows little change on the week, a quiet business having been put through at about 1s. 3½d. per lb. There is a fairly steady movement of acetic acid at round £66 per ton for the glacial quality, and £36 for the 80 per cent. commercial grade. Oxalic acid is still on offer at about £1 12s. 6d. per cwt., ex store.

Pitch is well held at about 47s. 6d. per ton, f.o.b., and a moderate business has been done. Creosote oil is still a very dull section, current values ranging from 3½d. to 4d. per gallon, naked at works. Solvent naphtha is steady and in fair request at about 1s. 3¼d. per gallon, naked. Crystal carbolic is on the quiet side at the moment at from 7d. per lb., f.o.b., with crude 60's in moderate demand, and values maintained at up to 2s. 6d. per gallon.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer to any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to April 12, 1930.

Eusmenol.

509,984. Class 1. Chemical substances for use in the dyeing industry. H. Th. Bohme Aktiengesellschaft (a joint stock company organised under the laws of Germany), 29, Moritzstrasse, Chemnitz, Saxony, Germany; manufacturers. February 1, 1930. To be associated with No. 509,987 (2,711).

Praedigen.

509,985. Class 1. Chemical substances for use in the dyeing industry. H. Th. Bohme Aktiengesellschaft.

Propylat.

509,986. Class 1. Chemical substances for use in the dyeing industry. H. Th. Bohme Aktiengesellschaft.

Smenol.

509,987. Class 1. Chemical substances for use in the dyeing industry. H. Th. Bohme Aktiengesellschaft. To be Associated with No. 509,984 (2,711).

Aerochrom.

510,181. Class 1. Photographic plates and photographic films (sensitised). I.G. Farbenindustrie Aktiengesellschaft (a joint stock company organised under the laws of Germany), Mainzerlandstrasse, 28, Frankfort-on-Main, Germany; manufacturers. February 7, 1930.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Director of Stores, Frontiers Administration, Alexandria, is inviting tenders, to be presented by April 12, 1930, for the supply within a period of twelve months commencing May 1, 1930, of the following articles: White lead, red lead, zinc white, red oxide, anti-corrosion composition, anti-fouling composition, pitch, common soda, caustic soda, sulphuric acid, carbolic acid. Reference No. C. 3,222.

Ideal Home Exhibition

Thanks to the increased space at Olympia, the *Daily Mail* Ideal Home Exhibition, which will be opened by the Lord Mayor of London and the Lady Mayoress on Monday next, will be on a larger and more lavish scale than even the best of its predecessors. Besides the many features of domestic interest a British Empire Section is to be appropriately housed in the Empire Hall. Canada, Australia, New Zealand, South Africa and the Irish Free State will all be officially represented and will each have an attractive display of foodstuffs produced in their respective countries. An array of typical Indian produce will be found in the Indian Section.

Nitrogen Fertiliser Market

Sulphate of Ammonia.—*Export.*—Although the demand for sulphate of ammonia for immediate consumption has been satisfactory in continental countries, the stocks of this product are still large, and the price remains at £8 3s. 6d. to £8 5s. per ton, f.o.b. U.K. port, in single bags. *Home.*—In the home market, merchants report that the demand is not quite as good as last year. This is hardly to be expected, because consumption last year showed a big increase on 1927–28, and the present year seems to be fraught with difficulties for farmers. Good buying is reported from the Midlands and the North. There is also evidence of increased interest in Scotland.

Nitrate of Soda.—Sales of this product have been reported in various parts of the country, but it is not expected that the total sales will be as great as last year.

Company News

AMERICAN CYANAMID CO.—A quarterly dividend of 40 cents per share has been declared on the "A" and "B" common shares, payable on April 1.

MINERALS SEPARATION.—In respect of the year ended December 31 last the directors recommend that a dividend of 25%, less income tax, be paid on April 8, 1930.

SOUTHALL BROTHERS AND BARCLAY.—The accounts for the year 1929 show a profit of £67,158, to which is added £16,726 brought in. The sum of £30,000 is placed to reserve and £21,384 is carried forward.

ASSOCIATED DYERS AND CLEANERS.—A final dividend of 1s. 4d. per share, less income tax, making 10% for the year 1929, with a bonus of 2½%, less tax, has been declared on the ordinary shares, payable on April 30.

THARSIS SULPHUR AND COPPER CO.—The net profit for the year 1929, after writing off £35,297 for depreciation, was £264,878. To general reserve is placed £115,000, and a dividend of 12½%, less tax, is recommended.

W. CANNING AND CO.—The net profits for the past year were £61,706 and £9,246 was brought forward. A final dividend of 7½ per cent., and a bonus of 5 per cent. are declared, making 15 per cent. To reserve is placed £20,000 and £12,951 is carried forward.

JOSEPH CROSFIELD AND SONS.—A dividend on the ordinary shares of 15% is proposed. The profit for the year ended November 30 last is £554,312 and £23,112 was brought in, making £577,424. The sum of £100,000 is placed to general reserve and £24,924 is carried forward.

BRITISH DRUG HOUSES.—The directors have decided to recommend the payment of a final dividend for the year ended December 31 last, of 5% on the ordinary shares, less tax, making 8% for the year. For 1928 the ordinary dividend was also 8%, which was paid in one distribution at the end of the period.

BRITON FERRY CHEMICAL AND MANURE CO.—After providing £3,108 for income tax, charging £10,212 for depreciation £4,598 for preference dividend, and transferring £3,000 to reserve, the credit of profit and loss, including the balance brought forward, is £10,014. A dividend of 1s. per share is to be paid on the ordinary shares.

YORKSHIRE INDIGO SCARLET AND COLOUR DYES.—After providing for depreciation of dyehouses, leasehold property, plant and machinery and all other charges, the year 1929 has resulted in a profit of £1,462, which, with the amount brought forward of £4,560, makes £6,022. Interest on debenture stock for the year absorbs £4,519, leaving a balance of £1,503, which the directors recommend should be carried forward.

WILLIAM GOSSAGE AND SONS.—The net profit for the year ended November 30, 1929, amounts to £264,744, to which is added brought forward of £29,393, making a total of £294,137. Dividend on 5% first cumulative preference shares takes £22,500, dividend on 6½% cumulative preference shares £48,750, to general reserve is placed £50,000 and interim and final dividends on ordinary shares, making 20% for the year, require £140,000, leaving to carry forward £32,887.

STEWARTS AND LLOYDS, LTD.—For the year 1929 the profits were £694,000. The directors have set aside £200,000 for depreciation, and recommend a final dividend of 1s. 6d. per share on deferred shares, less tax, placing £150,000 to reserve, and carrying forward £125,000. For 1928 the profits were £582,114, a sum of £175,000 was set aside for depreciation, £140,000 was placed to reserve, while a dividend of 1s. per share on deferred shares, less tax, was paid, carrying forward £122,895.

BEDE METAL AND CHEMICAL CO.—The operations for 1929 resulted in a profit (after writing off depreciation at Hebburn £6,400, and in Norway £4,444 and after making sufficient provision for income-tax) of £38,401, and brought forward was £4,804, making £43,205. The directors recommend a final dividend of 1s. 6d. per share (less income-tax), making 1s. 9d. per share for the year, placing to reserve fund, making it £22,000, £12,000, and to reserve for replacements, etc., £8,000, carrying forward £7,939.

LAGUNAS NITRATE CO., LTD.—An extraordinary general meeting was held on March 14 at Winchester House, London, under the chairmanship of Mr. Francis Watts, when resolutions for reducing the capital of the company from £900,000 divided into 180,000 shares of £5 each, to £180,000 divided into 180,000 shares of £1 each, and, upon such reduction taking effect, increasing the capital to £207,500, by the creation of 27,500 new shares of £1 each, ranking in all respects pari passu with the 180,000 reduced shares were approved.

ENGLISH MARGARINE WORKS.—The net profit on trading for 1929 amounts to £133,039, against £106,282 for 1928. Depreciation takes £22,695, to income-tax reserve is placed £12,083, and directors' fees absorb £2,150, leaving £96,111. With £18,027 brought in, there is £114,138. The year's preference dividend absorbs £35,000, and the directors recommend a dividend on the ordinary shares for the year at the rate of 8% less tax, as last year, writing off the balance of the cost of establishing the staff pension fund £26,000, and carrying forward £24,638.

SALT UNION.—The report and accounts, which have just been issued, show a net profit of £220,526, comparing with £229,882 in 1928, £265,078 in 1927, and £217,565 in 1926; brought forward £19,883 against £32,399 in 1928; debenture interest £42,283, against £42,297; available balance, £198,126, against £219,984. After providing for the dividends and £1,000 (as last year) for staff fund, there is a carry-forward of £27,126 against £23,984 last year (after additional fees voted for directors). There is no addition to contingencies account on this occasion, against £25,000 added last year.

BRITISH ALUMINIUM CO.—The profit, including the amount brought forward, for the year 1929, after making provision for taxation, and after charging amounts required for service of the Prior Lien Debentures and Debenture stock, and after further setting aside sums of £50,000 to depreciation reserve and £100,000 to reserve fund and £10,000 to staff benefit fund, is £153,637. After providing for dividend on the preference shares and for interim dividend of 4% on the ordinary shares, the directors recommend a final dividend of 6%, again making 10% for the year, leaving £35,559 to be carried forward, against £33,843 brought in.

INTERNATIONAL PAINT AND COMPOSITIONS CO.—After writing off bad debts, the profit for 1929 is £123,547. Provision for income tax takes £23,000, tax deducted from dividends is £10,485, and provision for depreciation is £6,219, leaving £104,813, which, with £15,246 brought in, makes £120,059. The year's preference dividend takes £12,000. The directors recommend that to reserve fund be placed £25,000, to investment reserve fund £5,000, written off Standard Paint Co. £10,000, and allocated to superannuation fund £3,000. It is proposed to pay a 7% final dividend on the ordinary shares, making 10% for the year, absorbing in all £52,250, carrying forward £12,809.

INTERNATIONAL ALUMINIUM CO.—The profit for the year 1929 amounts to £63,901. From this has to be deducted debenture and mortgage interest, directors', trustees', and auditors' fees, amounting to £20,282; also a further £1,000 which has been allocated to renewals reserve account. The net profit carried to balance-sheet is, therefore, £42,619, to which is added £9,198 brought foward, making £51,817 available for dividend and other purposes. Preference dividend absorbs £17,234 and directors recommend that balance of expenses relative to raising of capital amounting to £15,847 be written off, and that £7,500 be carried to reserve and balance of £11,235 be carried forward.

WRIGHT, LAYMAN AND UMNEY.—The accounts for the year ended September 30, 1929, show that after providing for directors' salaries as departmental managers, staff bonus, bad debts, depreciations, pensions and income-tax, there is a trading profit, including income from investments, of £40,595. Adding the amount brought forward of £15,494, there remains to credit of profit and loss £56,089. A dividend of 6 per cent. on the preference shares, less income-tax, takes £4,320, interim dividends of 10 per cent. on £90,000 ordinary shares, less income-tax, require £7,200 and directors' fees absorb £4,400, leaving £40,169. The directors recommend a further dividend of 15 per cent. on the ordinary shares, making 25 per cent. for the year, less income-tax, absorbing £10,800, and a bonus of 2s. 6d. per share on the ordinary shares, less income-tax, accounting for £9,000, carrying forward £20,369.

Superpressure Boilers

Remarkable New Steam Generation Plant

ANOTHER illustration of the advance in size and pressure of water tube boilers, of which in Great Britain the plant of Synthetic Ammonia and Nitrates, Ltd., is a characteristic example, has been provided by the Ford Motor Co. of River Rouge, Detroit, who recently placed with the International Combustion Engineering Corporation of New York an order for two steam boilers, each with a maximum capacity of 700,000 lb. evaporation per hour, and a pressure of 1,350 lb. per sq. in., the steam being superheated to 750° F.

There are now in operation three boilers of the " Double Ladd " type, 500,000 lb. normal evaporation and 800,000 lb. overload at the Hell Gate Power Station in New York, constructed in 1929, and operated with " Lopulco " pulverised fuel running at 425 lb. pressure and 705° F. superheat. There are also a considerable number of forged drum boilers running at from 900–1500 lb. per sq. in. pressure; but to construct huge boilers of 700,000 lb. evaporation per hour which will at the same time work under such conditions as 1,350 lb. per sq. in. pressure, is a new advance in steam generation practice.

These boilers are to be operated on the latest " Lopulco " pulverised fuel methods according to the " Wood " principle, the burners being placed at the top corners of the combustion chamber, facing downwards tangentially towards the centre, so as to give a violent mixing action of air and fuel within the combustion chamber. The latter will be constructed for all four walls of water-cooled steel tubes in series with the boiler, while air heating is included, with most of the hot air passed through " Raymond " centrifugal pulverisers, the remainder being apparently added to the combustion chambers and not passed through the burners. Further details of this plant will be awaited with the greatest interest, and it is understood also that there is to be included a turbine of 110,000 kw. capacity, while the erection will be commenced in the present year.

The Ford Co. is stated to have nearly 500,000 sq. ft. of boiler heating surface operated with pulverised fuel firing, while it was the first firm to instal very large water tube boilers, " Lopulco " pulverised fuel firing, and complete control of the working of boilers merely from one small control panel by a series of switches for adjusting instantly the supply of pulverised coal, as well as blast furnace and coke oven gas, if necessary; air for combustion, and feed water. From the point of view of British conditions, it is certainly difficult to understand the wisdom of such huge individual units if only because of breakdowns, but American engineers seem to have no doubts on the subject.

Catalytic Synthesis of Formic Acid

DR. S. R. CARTER, of the Chemistry Department of the University of Birmingham, lectured before the Society of Chemical Industry (Birmingham and Midland Section), at the University, on " Studies in the Catalytic Synthesis and Decomposition of Formic Acid," and gave an account of an investigation which he had carried out in collaboration with Professor Bredig. The work had resulted, he said, in the discovery of an artificial preparation of formic acid from gaseous hydrogen and carbon dioxide under pressure using palladium as a catalyst. The direct synthesis of formic acid from hydrogen and carbon dioxide was of considerable iterest to chemists, as it furnishes one of the few instances of a direct synthesis of a typical organic substance from inorganic constituents. Moreover, formic was finding increasing applications in many industries, particularly in the dye trade. As a rival to acetic acid it was slightly stronger, having mild reducing properties, while, weight for weight, it possessed greater neutralising power.

French Sulphuric Acid Development

RECENT developments in France directed towards greater independence in raw materials include the production of sulphuric acid from gypsum, for which a plant is to be installed at Saint-Chamas. It is expected that this will make the country independent of foreign pyrites and sulphur supplies. By a further development of synthetic ammonia, it is expected that supplies of all the raw material for the domestic requirements of nitric acid will be provided.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the " Registry of County Court Judgments " does not imply inability to pay on the part of the persons named. Many of the judgments may have been setiled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

MATTHEWS AND WILSON, LTD., 15, New Broad Street, E.C., druggists. (C.C., 22/3/30.) £10 11s. 5d. February 14.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CANNON AND CLAPPERTON (1926), LTD. Sandford-on-Thames, paper manufacturers. (M., 22/3/30.) Registered March 4, £20,000 debentures and bonus of 2½ per cent. to Friends' Provident and Century Life Office, 7, Leadenhall Street, E.C.; charged on interest in Sandford Mill, Sandford-on-Thames, and other properties, also general charge. *Nil. November 13, 1929.

NEW NORTHFLEET PAPER MILLS, LTD. (M., 22/3/30.) Registered March 4, £100,000 1st debenture stock repayable at a premium of 2½ per cent. (secured by Trust Deed dated March 4, 1930, supplemental to Trust Deeds dated February 20, 1929, etc., securing £250,000 debenture stock and premium of 2½ per cent.); charged as in previous deeds. *£250,000. October 17, 1929.

Satisfaction

MILTON PROPRIETARY, LTD., London, E.C., disinfectant manufacturers. (M.S., 22/3/30.) Satisfaction registered March 8, £10,500, part of amount registered December 14, 1925, etc.

New Companies Registered

BRITISH TAR PRODUCERS AND DISTRIBUTORS, LTD.—Registered March 13. Nominal capital, £1,000 in £1 shares. Tar producers and distributors, manufacturers of, agents for and dealers in all kinds of tar products, etc. Directors; A. Newsome, West End Gardens, Burley in Wharfdale; H. P. Hird, L. Booth and S. A. Hird.

COMMERCIAL ADHESIVES, LTD., 52, Farringdon Street, London, E.C.4.—Registered March 12. Nominal capital, £100 in £1 shares. Importers and manufacturers of and dealers in adhesives, etc. Directors: L. A. Copper, 32, Crawthew Grove, East Dulwich, London, S.E.22; R. S. Ollington.

LARVITE (FOREIGN AND COLONIAL RIGHTS), LTD. 8, Princes Street, London, E.C.2.—Registered March 13. Nominal capital, £12,000 in 40,000 " A " shares of 5s. each, and 40,000 " B " shares of 1s. each. To adopt an agreement with H. R. Seabrook, Brakspar Syndicate, Ltd., and Rota, Ltd., etc., to produce, manufacture and deal in tar, pitch, bitumen, sulphate and other forms of ammonia, oils and chemical elements, owners, lessors or lessees of coal and other mines, etc. A subscriber: W. H. Walford, 10, Lambourne Road, Leytonstone, London, E.11.

Tung Oil Exports from Hankow

THE total January exports of tung oil from Hankow were 12,666,000 lb., of which 11,064,000 lb. went to the United States and 1,602,000 lb. to Europe. It was estimated that stocks of oil on hand at Hankow at the end of January were 2,500 short tons.